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TRANSACTIONS

OF THE

ROYAL ACADEMY OF MEDICINE IN IRELAND.

TRANSACTIONS

OF THE

Royal Academy of Medicine

IN IRELAND.

VOL. XI.

EDITED BY

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BOSTON MED.
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EDINBURGH: JAMES THIN.

BRISTOL: JOHN WRIGHT & CO.

1893.

DUBLIN: PRINTED BY JOHN FALCONER, 53 UPPER SACKVILLE-STREET.

CATALOGUED
FEB 12 1894
E. H. B.

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ROCHE, R. J., 6 Upper Sherrard-street.

TAYLOR, WM., 21 Heytesbury-street.

TENNANT, ELIZ. A., St. Helen's, Claremount-road, Sandymount.

TIGHE, J. M., 14 Anna Villa, N. C. Road, Dublin.

WHITE, ARTHUR, 81 Grosvenor-road, Rathmines.

RULES.

1. The name shall be, "ROYAL ACADEMY OF MEDICINE IN IRELAND." (1887)

Constitution.

2. The Academy shall consist of Fellows, Honorary Fellows, Members, and Student Associates.

Management.

3. The affairs shall be managed by a Council, consisting of the President, Ex-Presidents (1893), the six Presidents of Sections, the General Secretary and Treasurer, the Secretary for Foreign Correspondence, six Secretaries of Sections, and eight Councillors, being two representatives from the Medical, Surgical, Obstetrical, and Pathological Sectional Councils respectively.

Meetings.

4. The Meetings shall be General and Ordinary.

Publication of "Transactions."

5. The "Transactions" shall be published by the Council, subject to the provisions hereinafter contained.

Original Fellows and Members.

6. All the Members of the present Societies (Medical, Surgical, Obstetrical, and Pathological) shall be Original Fellows or Members, without entrance fee, on payment of the annual subscription on or before 31st December, 1882.[a]

Fellows.

7. Fellows of the King and Queen's College of Physicians in Ireland, and of the Royal College of Surgeons in Ireland, shall be admitted, without ballot, on payment of the entrance fee and the subscription for the current year. All others, being Registered Medical Practitioners not directly or indirectly engaged in the sale of drugs, shall be proposed by two Fellows, and elected by ballot by the Council.

8. Candidates shall be proposed at one Meeting of the Council, and balloted for at the next—one black bean in four to reject.

8A. That all Rules referring to the admission of Fellows, Members, and Student Associates shall be interpreted as referring to Ladies as well as Gentlemen.

Privileges of Fellows.

9. Fellows only shall be eligible for office in the Academy. They shall have the privilege of attending all Meetings of the Academy, of making Communications, and of voting and speaking at such meetings. They shall also receive a copy of the "Transactions."

[a] Those who have paid a Life Subscription to any of the above Societies will be admitted to the privilege of Fellows on payment of Member's subscription.

10. These privileges shall not be exercised by any Fellow in arrear with his subscription.

Honorary Fellows.

11. Honorary Fellows, limited in number to 25, may be nominated by the Council, and elected, on motion at a General Meeting of the Academy by a majority of at least two-thirds of those present and voting.

Members.

12. Any Registered Medical Practitioner may be elected as a Member, the election to be conducted in the same manner as that of Fellows.

Privileges of Members.

13. Members shall have the privilege of attending the Ordinary Meetings of the Academy, of making Communications, and of taking part in debate. They can purchase the "Transactions" at cost price.

Student Associates.

14. Registered Medical Students, of the third or subsequent years, may be elected as Student Associates in the same manner as the Members.

15. Student Associates shall have the privilege of attending the Ordinary Meetings of the Academy.

Annual Subscription.

16. Fellows shall pay £2 2s., and Members £1 1s. Student Associates shall pay 5s. The Subscription shall become due on the 1st of October in each year, and if the Subscription be not paid on or before the first Meeting in February, the defaulter shall cease to belong to the Academy, unless the delay shall be accounted for to the satisfaction of the Council. No Fellow shall vote at the Annual General Meeting who has not paid his subscription for the year. Medical Officers of the Army and Navy, and Registered Medical Practitioners not residing within 15 miles of Dublin, are eligible as Fellows of the Academy on payment of the entrance fee, and an annual Subscription of £1 1s.

Entrance Fee.

17. After admission of Original Fellows, all Fellows shall pay an entrance fee of £1 1s.

Council.

18. The Council shall meet on the first Wednesday in the month throughout the Session, or oftener should they see occasion—five to form a quorum.

19. Notice of all Extraordinary Meetings shall be transmitted by the Secretary to every Member of the Council. The President or any five Members of Council may call an Extraordinary Meeting of the Council. The Council shall determine questions by vote, or by division if so demanded, the President having a casting vote only. Any regulation of the Council shall have the force of a law, until submitted to the next General Meeting. The Council shall have the power of filling up any vacancies which may occur in the list of Officers of the Academy, except that of President, before the Annual General Meeting. If a vacancy in the office of President should occur, the General Council shall summon a Special General Meeting of the Academy to fill such vacancy. (1888.)

Sectional Councils.

20. There shall be six Sectional Councils elected by the Annual General Meeting in October, termed respectively—the Medical, the Surgical, the Obstetrical, and the Pathological, the State Medicine, and the Anatomical and Physiological Councils.

21. No Fellow shall be eligible as a candidate for election on more than two Sectional Councils, but no Fellow shall be eligible as a candidate for election on both the Medical and Surgical Sectional Councils. (1888.)

22. Each Sectional Council shall consist of the President of the Section and ten Members, one of whom shall act as Secretary to the Section ; except the State Medicine and Anatomical and Physiological Councils, which shall each consist of a President and six Members. (1888).

Meetings of Sectional Councils.

23. Each Sectional Council shall meet on a fixed day at least one week before the Ordinary Meeting of their Section, three to form a quorum.

Powers.

24. Each Sectional Council shall have the power of making any such arrangements as it thinks necessary to carry on the work of the Ordinary Meetings which are under its charge, provided that such arrangements do not interfere with the general laws of the Academy ; and any Rules laid down by such Council shall have the force of laws at the Ordinary Meetings under its charge, until submitted to the General Council.

25. Each Sectional Council shall have the power of filling up any vacancies that may occur among its Members until the Annual General Meeting.

Committee of Reference.

26. The Council shall appoint a Committee of Reference, to report upon morbid growths and other specimens exhibited before the Academy ; of this Committee the Exhibitor shall, for the occasion, be a Member.

Officers.

27. A President, to be elected by the Annual General Meeting in October, and to hold office for three years.

28. The Presidents of the Colleges of Physicians and Surgeons for the time being shall be the Presidents of the Medical and Surgical Sections. The Presidents of the other Sections shall be elected by the Fellows at the Annual General Meeting, and shall hold office for two years. (1888.)

29. One General Secretary and Treasurer to be elected at the Annual General Meeting.

30. It is expedient that a fixed salary (of one hundred guineas) shall be paid yearly to the General Secretary in consideration of the fact that the editing of the "Transactions" is part of his duties.

31. One Honorary Secretary for Foreign Correspondence to be elected at the Annual General Meeting. (1888.)

32. The Councillors for each Section to be elected at the Annual General Meeting. Each Sectional Council shall elect two Members to act on the

General Council, except in the case of the Sections of State Medicine and Anatomy and Physiology. (1888.)

33. Two Members in each Sectional Council shall retire annually, and be ineligible for re-election for one year.

34. Six Secretaries, one for each Section, to be appointed by the Sectional Councils.

35. At all elections after the year 1882, any Fellow desirous of nominating a candidate for election shall, at least one fortnight before the Annual General Meeting, forward an application to the General Secretary to enter the name of such Fellow on the list of candidates for office, provided that the Fellow so nominated shall have consented to act. (1891.)

36. That all elections shall be by ballot.

Duties of Officers.

37. *The President* shall preside at the Annual and Special General Meetings and at General Council Meetings. In the absence of the President, the Chairman shall be appointed by the meeting. (1888.)

38. *The Presidents of Sections* shall preside at the Ordinary Meetings of the Academy, and shall also preside at the Sectional Council Meetings. In the absence of the President, the Chairman shall be appointed by the Meeting. (1888).

39. *The General Secretary* shall attend all General Meetings of the Academy and General Council. He shall take minutes of such meetings, to be read at the following meeting.

40. He shall receive and have charge of all papers intended for publication in the "Transactions" of the Academy, after they have been handed over to him by the Secretaries of the several Sections.

41. He shall, on receiving notice from the Secretary of a Section, send out to all the Members notices of the title or titles of the paper or papers for the next Ordinary Meeting, with the name or names of the authors, and, so far as possible, of the subjects for Exhibition, with the names of the Exhibitors.

42. He shall arrange for the Exhibition of specimens and the reading of papers, which are forwarded to the Academy by those who are absent, or are not members.

43. The General Secretary and Treasurer shall receive all moneys, and lodge the same in bank to the account of the Academy, and all cheques shall be signed by the Treasurer and one other Councillor.

44. The Accounts shall be audited by two Fellows, not Members of Council, to be appointed by the President at some meeting previous to the Annual Meeting.

Duties of Secretaries of Sections.

45. To attend the Meetings of the Council of the Section and the Ordinary Meetings of the Academy, under the management of said Council, and to take minutes at such meetings, to be read at the next following meeting of that Section.

46. To keep such papers as the Sectional Councils deem worthy of publication, for the purpose of handing them over to the General Secretary.

47. To inform the Secretary of the Committee of Reference of any specimens referred to that Committee, and to transfer the specimens to that Secretary.

48. To give notice to the General Secretary, one week previously to the meeting, of the titles of papers for the evening, the names of the authors, and, so far as possible, the objects for Exhibition, with the names of Exhibitors, so that the General Secretary may inform the Members.

Meetings.

49. The Annual General Meeting to take place on the last Friday in October, for the election of Officers and Members of Council, and for the general business of the Academy.

50. Due notice of the meeting shall be given by the Secretary to all members at least three weeks previously. (1891.)

51. No motion involving a change of these Rules shall be brought before this meeting except one week's notice thereof shall have been given by the Secretary to each Member.

52. The President may—and shall forthwith, on receiving a requisition signed by seven Fellows, at any time—on giving one week's notice, summon a Special General Meeting, for the consideration of particular business, the nature of which must be specified in the letter of summons convening the meeting, and at such meeting no other business can be transacted. In the event of the President being unable, from any cause, or declining, to summon a Special General Meeting of the Academy, it shall be in the power of the General Council to summon such meeting. (1888.)

Ordinary Meetings.

53. The communications to be submitted to the Ordinary Meetings shall be grouped under the following heads :—Medicine, Surgery, Pathology, Obstetrics State Medicine, and Anatomy and Physiology ; and the conduct of such meetings shall be in the hands of the several Sectional Councils, each Sectional Council to have the management of the Ordinary Meeting in rotation, as arranged by the General Council. (1888.)

54. The Ordinary Meetings shall be held on every Friday evening, from the first Friday in November until the last Friday in May, inclusive, at eight o'clock, except during the Christmas and Easter recesses.

55. All Fellows, Members, and Student Associates attending the meetings, shall write their names in the attendance book.

56. Any Fellow or Member may introduce two Visitors by cards obtained from the Sectional Secretaries.

57. Officers of the Army or Navy Medical Departments shall, on presenting their cards, be admitted to the Ordinary Meetings of the Academy.

58. No communication shall exceed twenty minutes in its delivery, nor any speech thereon ten minutes, except by permission of the Chairman. No one shall speak twice upon the same communication, except the author, who has the right of reply.

58 (*a*). A paper by any other than a Fellow or Member of the Academy shall not be read before the Academy unless the author of such a communication shall have obtained permission to do so from the Council of the Section before which the communication is proposed to be read. (1892.)

Ordinary Meetings.—Order of Business.

59. (1.) Chair to be taken at 8 30 p.m.

(2.) Chairman to read list of specimens, &c., exhibited by card, together with the names of the Exhibitors.

(3.) No Pathological Specimen shall be exhibited at any Section other than the Pathological and Obstetrical, except by card. This Exhibition shall not exclude any subsequent communication regarding it at the Pathological Section.

(4.) There shall be no Exhibition of Specimens by card in the Obstetrical or Pathological Sections.

(5.) Any member shall have liberty to exhibit any recent specimen at any of the meetings of the Obstetrical Section, provided it illustrates any question in gynæcology.

(6.) At the meetings of the Obstetrical Section recent specimens may be exhibited, and the President shall invite discussion thereon, provided that such exhibition of specimens or discussion, if any, thereon, must terminate at 9 o'clock, p.m., but that, if necessary, they may be resumed after the papers for the evening have been read and discussed.

(7.) Chairman to ask if any member has any observations to make or motion to propose relative to any living specimen on the List of Exhibition.

(8.) Chairman to call upon the author of the first paper on the list to read his paper.

(9.) Chairman to call upon members to discuss the paper, or, at his discretion, to take any other paper or papers on the list relating to the subject, and have the discussion subsequently on all such papers collectively.

(10.) When the last paper has been discussed, the Chairman to ask if any member desires to speak upon any of the specimens exhibited by card.

(11.) After the discussion upon any specimen, the Exhibitor has the right of reply.

Regulations regarding the Exhibition of Specimens by Card.

60. (1.) Any member may exhibit by card at any Ordinary Meeting, except at the meeting of the Pathological and Obstetrical Sections. At the meetings of the Pathological all specimens must be presented and described *viva voce*, and debate may be invited thereon.

(2.) Notice shall, if possible, be given to the General Secretary, or the Secretary of the Section, on or before the previous Ordinary Meeting.

(3.) Specimens must be in the room at 7 45 on the night of Exhibition.

(4.) Specimens for Exhibition by card shall be open for inspection at 8 p.m.

5.) A card, containing all particulars for publication, shall be placed with the Specimen. Cards for this purpose are to be obtained from the Secretary.

(6.) The Exhibitor should be present, and he shall furnish further details if asked for.

(7.) Every Exhibitor shall submit the Specimen or Specimens on view to the Committee of Reference, if the meeting so decide.

Exhibition of Pathological Specimens.

61. No lengthened reference to treatment shall be allowed upon any Specimen, except by the express permission of the Chairman. Whenever it has been agreed that a Specimen exhibited at a Sectional Meeting of the Royal Academy of Medicine in Ireland shall be sent to the Reference Committee to report thereon as to its nature, the Exhibitor is to retain the custody of the specimen until he shall be summoned to a meeting of said Committee to be convened by its Secretary, on an early day, when he will attend and submit it for examination. (1889).

By-laws concerning "Transactions."

62. The "Transactions" shall consist of such Communications made to the Academy by or through Fellows or Members as may be deemed by the General Council suitable for publication; also, of discussions of importance or interest arising out of such Communications.

63. All Communications accepted by the Academy become the property of the Academy, but authors may also print their Communications, subsequent to the reading of the same before the Academy, in any publication in addition to the "Transactions." Papers shall be handed to the Secretary of the Section immediately after they have been read. (1891.)

64. The "Transactions" for the year shall be presented to all Fellows of the Academy who have paid their Annual Subscriptions.

65. The "Transactions" may be purchased by Members at cost price.

66. The Publication Committee of each Section shall meet not later than the Tuesday after each meeting of the Section, for the purpose of abstracting the proceedings—the abstract to be placed in the printer's hands on same evening, and forwarded to the editors of medical journals with the least possible delay. (1888.)

67. Contributors of papers are requested to send their papers to the Academy printer early enough to allow of their being put in type before the meeting, and read in proof. (1888.)

68. That on the evening of the day of meeting of the Sectional Council, when the papers for the next meeting have been decided upon, a circular be sent to each contributor informing him:—

(1.) That he is expected to be ready or else take his place at the bottom of the list.

(2.) That he must have an abstract ready with his paper, otherwise he will be noted in the published proceedings in such form as the Publication Committee think fit.

69. The General Council is empowered to defray the expenses in whole or in part of any illustrations which it may consider advantageous to the elucidation of the papers published by the Academy.

70. An abstract (prepared by the author) of each communication made at the Academy, along with a report of the discussions thereon, shall be furnished to the editors of such medical journals as may desire to publish them, and the authors of such communications shall be empowered to publish their papers *in extenso* in any periodical or periodicals they may think fit, such communications also to appear in the "Transactions," provided the Council consider them worthy of insertion.

Expulsion of Fellow or Member.

71. Expulsion of a Fellow or Member can take place only at a General Meeting of the Academy, on the motion of the Council, if two-thirds of the Members present shall vote for the same by ballot. Of such ballot the Council must give at least fourteen days' notice in writing to every Fellow of the Academy.

New Laws.

72. New Laws, or alterations in existing Laws, can be proposed only at the Annual General Meeting. Any Fellow proposing such alteration shall give notice to the General Secretary at least ten days before the General Meeting in October.

REPORT.

THE General Council begs to report that the number of Fellows for the Session 1891–92 was 249; of Members, 33; of Students, 10. The Fellows increased by 6; the Members by 6; and the Students decreased by 2.

The lamented death of H.R.H. the Duke of Clarence and Avondale stirred the deepest sympathies of the nation, and your President deemed it his duty at once to transmit the following telegram to Sandringham:—

> "The President of the Royal Academy of Medicine in Ireland begs to express, on behalf of the Academy, respectful heartfelt sympathy with their Royal Highnesses the Prince and Princess of Wales, and the Princess May, in their most sorrowful bereavement.
>
> "G. H. KIDD."

To this the following reply was received:—

> "Sandringham, *January* 16, 1892.
>
> "Their Royal Highnesses send their heartfelt thanks for your kind telegram.
>
> "DE WINTON."

At the following Meeting of Council the President was thanked for his action on behalf of the Academy, and the following resolution was ordered to be forwarded to the Home Secretary, Mr. Matthews:—

> "That the Council of the Royal Academy of Medicine in Ireland at this their first Meeting since the lamented death of H.R.H. the Duke of Clarence and Avondale, K.G., K.P., do respectfully offer to Her Majesty the Queen an expression of their condolence and sympathy with her in her sad bereavement."

The Home Secretary laid this resolution before Her Majesty, who was pleased to receive it very graciously.

The financial statement shows a sum of £591 16s. 9d. in 2¾ per cent. Consols, and a balance in bank of £76 16s. 6d., after payment of all expenses, including £50 to close an old account due to Mr. J. Falconer for printing.

The question of reporting the proceedings at the Sectional Meetings has been under the consideration of the General Council on several occasions, but no decision has been arrived at, and the subject is now referred to the Academy.

The Council regret to report the death of the following Fellows:—

Thomas Evelyn Little, Dublin; F. Victor M'Dowel, Ballinglass; B. Madigan, Kilrush; John M'Donnell, Dublin; James Wharton, Dublin.

G. H. KIDD, *President.*
W. THOMSON, *General Secretary.*

General Treasurer's Report for the Session 1891–92.

RECEIPTS.

	£	s.	d.
To Balance in Bank, Oct. 13th, 1891	11	12	6
„ Subscriptions	504	13	0
„ Dividends on Consols (£591 16s. 9d.)	15	19	8
Total	£532	5	2

EXPENDITURE.

	£	s.	d.
General Secretary	105	0	0
Illustrations, Vol. IX.	16	2	8
Fannin & Co., Vol. IX.	168	1	0
J. Falconer & Co., Printing Slips, &c.,	20	15	0
Stationery	3	4	2
General Advertiser, Printing and Postage	55	8	9
Burke & Co., Groceries	17	17	6
Attendance	20	10	0
Falconer, Balance Old Account	50	0	0
Carey & Ashenhurst	1	15	0
Sundries and Postage	2	0	0
Balance in Bank	76	16	6
Total	£532	5	2

We have examined the Treasurer's Statement of the Accounts of the Royal Academy of Medicine for the Session 1891-92, and we find it correct.

{G. P. L. NUGENT.
{A. W. W. BAKER.

October 14th, 1892.

WM. THOMSON, *General Secretary and Treasurer.*

Volume XI. of the "Transactions" has been forwarded to the following:—

Lancet	London.
British Medical Journal	Do.
Medical Press	Dublin.
Hospital Gazette	London.
Dublin Medical Journal	Dublin.
London Medical Recorder	London.
Edinburgh Medical Journal	Edinburgh.
Glasgow Medical Journal	Glasgow.
Liverpool Medical Journal	Liverpool.
Bristol Medical Journal	Bristol.
Asclepiad	London.
International Medical Journal	Do.
Annals of Surgery	Do.
Provincial Medical Journal	Leicester.
Birmingham Medical Review	Birmingham.
Sanitary Record	London.
Practitioner	Do.
College of Surgeons	Dublin.
Do.	London.
Do.	Glasgow.
Trinity College	Dublin.
Royal University	Do.
Queen's College	Belfast.
Do.	Galway.
Do.	Cork.
Royal Dublin Society	Dublin.
College of Physicians	Do.
Do.	Edinburgh.
Do.	London.
Faculty of Physicians and Surgeons	Glasgow.
Victoria University	Manchester.
University College	London.
Harveian Society	Do.
Pathological Society	Do.
Clinical Society	Do.
Medical and Chirurgical Society	Do.
Apothecaries' Hall	Do.
King's College	Do.
University	London.
Do.	Glasgow.
Do.	Edinburgh.
Do.	Durham.
Do.	St. Andrews.
Do.	Aberdeen.

University College	Dundee.
Do.	Melbourne.
Do.	Sydney.
Do.	Adelaide.
Do.	Calcutta.
Do.	Bombay.
Do.	St. Petersburg
Do.	Paris.
Do.	Vienna.
Do.	Berlin.
Do.	Brussels.
Do.	Bologna.
Do.	Madrid.
Do.	Amsterdam.
Do.	Christiania.
Do.	Stockholm.
Do.	Toronto.
Do.	Quebec.
Do.	New York.
Do.	Philadelphia.
Do.	New Zealand.
Do. Library	Tokio, Japan.
Medical Institute	Birmingham.
Dr. Ashby	Do.
Director-General Billings	Washington, U.S.
Journal de Médecine et de Chirurgie (M. Lucas Championière)	Paris.
Archives de Chirurgie	108 Boulevard St. Germain Paris.
Archiv für Klinische Chirurgie	Berlin.
Centralblatt für die medicinischen Wissenschaften	Do.
Zeitschrift für Chirurgie	Do.
The Australian Medical Gazette	Sydney, N.S.W.
Spitalul	Bucharest.
New York Medical Journal	New York.
Journal, American Medical Association	Chicago.
Bulletin de l'Académie Royale de Médecine de Belgique	Brussels.
Medical Journal	Brooklyn.

Naturforschende Gesellschaft, Dr. Rudolf Martin, Seefeldstrasse 119, Zurich.
Academy of Medicine, 17 West 43d Street, New York.
Library, College of Surgeons, Edinburgh.
" British Medical Journal, 429 Strand, London.
" Medico Chirurgical Society, Bristol.
Sheffield Medical Journal, 17 Eyre Street, Sheffield.
Archives Cliniques de Bourdeaux, 46 Cours du Jardin-public, Bordeaux.
Medical Society of Victoria, Melbourne (Meyer and Metzler, Great Portland Street, London).

BOSTON MEDICAL
FEB 12 1894
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TRANSACTIONS

OF THE

ROYAL ACADEMY OF MEDICINE IN IRELAND.

SECTION OF MEDICINE.

SATURNINE ENCEPHALOPATHY.

By JOSEPH O'CARROLL, M.D., F.R.C.P.;
Physician, Richmond, Whitworth, and Hardwicke Hospitals, Dublin.

[Read before the Section of Medicine, November 18, 1892]

The fact that lead is capable of producing ill effects on the brain has been recognised from early times. But it was reserved for Tanquerel des Planches, who studied lead-poisoning in the Paris hospitals between 1831 and 1839, to complete the clinical description of the various conditions which brain-poisoning by lead presents, and to unite them under the name *encéphalopathie saturnine.*

As exceedingly little has been added to the clinical aspect of the subject since the publication of his work,[a] I shall have to draw largely on it in my account of the disease, noticing afterwards some modern references to the subject.

"The cerebral phenomena of lead-poisoning," says Tan-

[a] Traité des maladies de plomb ou saturnines. . . . par L. Tanquerel des Planches, docteur de la Faculté de Médecine de Paris. 1839. He appears to have first used the term *encéphalopathie saturnine* in a paper in the "Journal Hebdomadaire" for October, 1836. For brevity I shall imitate other writers in speaking of him throughout this paper as Tanquerel.

querel, "are delirium, coma, convulsions, accompanied perhaps by more or less sensory defect. . . . It is a non-febrile neurosis of the encephalon of so variable physiognomy that between morning and evening, between to-day and to-morrow, the symptoms which declare its existence may change completely in aspect or in form." This rapidity of change in its symptoms is one of its principal characters. The onset of encephalopathy may be sudden, or it may be heralded for a longer or shorter time by prodromata, some of which may distinctly suggest lead-poisoning, but are so commonly unattended by head symptoms as to give us no indication of the onset of encephalopathy, while others may suggest brain disturbance without giving any hint of the cause. To the former class belong the various common phenomena of lead-poisoning, "dropped wrist," colic, arthralgia, the slate-coloured line on the gums,[a] and a peculiarly fœtid breath; the latter group includes headache, giddiness, tinnitus aurium, diplopia or amaurosis,[b] together with slight intellectual and moral changes in the direction of fidgetiness, sluggishness of ideation, moroseness, sleeplessness, or unpleasant dreams.

In its full development saturnine encephalopathy, as limited by Tanquerel, appears in one of four forms—namely, the *delirious*, the *comatose*, the *convulsive* form, or a combination of two or all of these, the *mixed* form. Of Tanquerel's 72 cases, 18 presented the delirious form alone, with 2 deaths, while 34 presented delirium, coma, and convulsions, with 9 deaths. His total mortality was 16 out of 72 cases observed

[a] It is interesting to note that the blue line remarked by Burton as a sign of lead-poisoning in 1840 is very fully described by Tanquerel in 1839, and had probably been noticed even earlier.

[b] The affections of vision which occur in saturnine encephalopathy are to be distinguished from the affections of the optic nerve (mainly atrophic) which are frequently seen in lead-poisoning; the former are central, the latter are peripheral lesions.

by him—a percentage of 22; while of the cases of other writers, as reported by Tanquerel, the mortality is about double that figure. This difference, however, as he suggests, is probably due to the fact that other observers were struck by the cases of grave illness and rapidly fatal result, while they forgot, or failed to recognise, the less grave cases which recovered. Either estimate is sufficient to demonstrate that saturnine encephalopathy is always a grave disease.

As the combination of two or three of these phenomena—delirium, coma, and convulsions—is the most frequent form of lead encephalopathy, so its prominent characteristic is, if I may say so, its inconstancy of symptoms. A case may at one visit present delirium, at another coma; to-morrow coma may have given place to convulsions, the day after the phenomena may be reversed; and each change may occur without warning, and often with extraordinary suddenness. I gather from Tanquerel that the prognosis is hopeful in proportion to the predominance of the least grave symptom, delirium, and gloomy in proportion to the predominance of convulsions. If coma persists beyond three days death is probable.

Tanquerel records a large number of *post-mortem* observations by himself and others. As might be expected from the variable character of the disease, and from the fact that a considerable number of cases recover, no constant and well-marked lesion seems to have been discovered. But the observations may for the most part be thrown into three groups, which, allowing for the wide limits of error involved in pathological examinations, are by no means contradictory of one another. A large number of brains appeared normal; a smaller number showed a flattening of the convolutions, which in some cases suggested atrophy, and in some cases hypertrophy, of the brain; while a third group showed accumulation of serous fluid under the meninges, and some-

times in the ventricles. It is pretty evident that a case which has excess of serous fluid over the cortex is very likely to present depressed convolutions, while excess in the ventricles may well give rise to apparent hypertrophy, with flattening of the convolutions against the cranium.

I now turn to modern authorities. I find that the subject is practically untouched in von Ziemssen's Cyclopædia, and that Strümpell devotes but three lines to it in an appendix on Poisons. Savage ("Insanity and Allied Neuroses," 1886, pp. 340 and 431) notes acute mania, post-epileptic dementia, and a condition simulating general paralysis as occurring in lead-poisoning, and gives his adhesion to the view that lead-poisoning may cause genuine general paralysis. Hilton Fagge confines himself to the following statement ("Pract. of Medicine," 1888, I., 864):—"Lead-poisoning may produce maniacal excitement, or it may end in dementia. The same poison may produce all the symptoms met with in general paralysis, and may almost certainly give origin to that disease. It also leads to epilepsy and its results." He records in another part of that work (p. 673) a case of atrophy of the brain with excess of fluid, in a compositor who came under treatment for colic and paralysis; while the editor, Dr. Pye Smith, mentions a case ascribed to lead-poisoning in which the brain was perfectly normal.

Gowers ("Diseases of the Nervous System," 1888) deals pretty fully with saturnine encephalopathy, quoting Tanquerel for the name, but giving credit apparently to several modern writers for points noted long before them by him. His own observations are of distinct value as confirming or supplementing the work of the French authority. He states, for instance, that in several cases within his own experience "convulsions, similar in character and course to those of ordinary epilepsy, occurred in the subjects of lead-poisoning, without other symptoms, and continued for years after the

toxic influence had ceased;" and again, that the affection of vision so commonly met with in this disease may be independent of ophthalmoscopic changes, and also of any renal affection. I find in Pepper's "Cyclopædia of Medicine" a short abstract of Tanquerel's work; in Flint's "Text-book of Medicine" the subject is still more briefly treated, and evidently quite at second-hand. Both Flint and Lauder Brunton ("Pharmacology and Therapeutics," p. 701) suggest that the cerebral symptoms which form the subject of this paper are really due to uræmia—a supposition which is not merely quite unjustified by clinical experience, but is open to a great many almost self-evident objections.

In the Goulstonian lectures on lead-poisoning, delivered in March, 1891, before the Royal College of Physicians of London, by Dr. Thomas Oliver, of Newcastle-on-Tyne, I find several interesting clinical records bearing upon the cerebral form of lead-poisoning. One is of a ballet-girl who had colic, headache, and amaurosis, the result of using a cosmetic containing lead. Another, of an elderly lady who had used a hair-dye, who had diplopia, ptosis of one eyelid and left strabismus, and who was found dead in her bed shortly after the administration of a few grains of iodide of potassium. He refers to cases of insanity in association with the wearing of false teeth mounted in cheap lead-containing plates. In his experience, as in that of Tanquerel[a] and Gowers, the effect of lead does not cease the moment the external influence is withdrawn; fresh attacks may occur without fresh exposure, as though from time to time, under some specially solvent action of the tissue fluids, lead were taken out of some organ in which it had been deposited and thrown into the circulation to affect anew the most vulner-

[a] Tanquerel observed a man who had formerly been a house-painter, but who had been for eight years removed from contact with lead, who, however, each year had colic and brain-troubles of the character associated with lead-absorption.

able part. He agrees with Tanquerel that lead encephalopathy may occur without the blue line on the gums. On the mental aspect of lead-poisoning he presents several valuable contributions, amongst which I may recall the following:—Cases of hysteria, determined by lead and not always of favourable prognosis, since this hysteria may be merely the forerunner of perhaps fatal encephalopathy; a case of epileptiform convulsions, followed for several days by loss of memory, which recovered; a case quoted from the Waterford Asylum Report for 1871 by Dr. (now Sir Francis) MacCabe, in which a white-lead worker with blue line on gums had monomania with depression, and recovered under treatment by iodide of potassium; and, lastly, a case which simulated pretty closely general paralysis of the insane, in which the urine contained lead, but no albumen, and in which, on *post-mortem* examination, the brain was watery and there was considerable accumulation of serum under the arachnoid membrane.

In Eulenburg's "Real-Encyclopädie der gesammten Heilkunde" is an admirable and acknowledged abstract of Tanquerel's work, by L. Lewin, of Berlin, with the addition of a note on convulsions and coma produced in dogs by the experimental administration of lead, and a condensed statement of German views on the ætiology of lead encephalopathy, which runs as follows: "Starting from the observation that shortly before and during the epileptic attacks there is a substantial decrease in urine excretion, Traube pointed out the likeness between this condition and that of uræmic intoxication. Following this further, some investigators hold that they have found albumen in the urine, while others deny its presence. All, however, agree that cerebral anæmia is the causative factor in the convulsions, coma, &c. According to Rosenstein (Virchow's Archiv. XXXIX.), the anæmia occurs through the stimulation of the unstriped

muscle-fibres of the small cerebral vessels and capillaries by the lead deposited in the brain; whilst Heubel ('Pathogenese und Symptome der chronischen Bleivergiftung,' Berlin, 1871) attributes it to the condition of œdema and the greater wateriness of the brain, as proved experimentally, through which it is intelligible that compression of the brain-capillaries may occur. According to him the œdema occurs by increase of lateral pressure in the vessels in consequence of the diminution of diuresis caused by lead. For those cases in which neither œdema nor anæmia of the brain has been demonstrated, he offers as cause of the eclampsia a resorption into the blood of urinary constituents (urea and potassium salts). As against this view, Harnack sees the cause of the encephalopathy in a directly-stimulating action of lead upon the brain-centres."

I shall not dilate upon the treatment of lead encephalopathy; it resolves itself into symptomatic and eliminatory. The latter indication is, as far as our present knowledge goes, best fulfilled by iodide of potassium; but it by no means follows that the iodide ought to be administered during the cerebral attack. If the phenomena be due to the direct action of lead upon the nerve centres, then any drug which temporarily increases the amount of lead in solution in the body-fluids would be liable to do harm. The symptomatic treatment is in no wise peculiar; but I may point to the fact that most authors, from Tanquerel to the writer in Eulenburg's Encyclopædia, speak well of opium, as a clinical argument against the view which attributes this disease to a primary uræmia. Other sedatives may also be of service; the bowels, which form one of the eliminatory channels for lead, should be kept free; leeching, blistering, and various other procedures may seem desirable in particular cases. Needless to say that the patient should be absolutely withdrawn from the influence of lead.

I have delayed thus long in coming to my own cases, only four in number, in the hope that in the light of the wider experience of some of the authorities I have quoted, many details of my cases would have an interest which would be entirely wanting without such illumination. I shall take them in the order in which they occurred :—

Case I.—A civil servant, aged forty-nine, of good personal and family history, came home from his office one day near midsummer, nine years ago (1883), complaining of headache. He went to his office for the next three days, still suffering from headache, and in the afternoon of the fourth day was brought home in a stupid condition. For the next three weeks he had gradually increasing symptoms of what was called "congestion of the brain," and at the end of this time he became comatose. I was asked by the surgeon who had charge of the case to sit up at night with the patient, and from that time to the present I have had him under frequent observation. The coma lasted two days, during which the treatment consisted of nutritive enemata and rectal injections of ether to combat great cardiac depression. Then muscular power and the faculty of speech gradually returned, but for several days the patient had delusions of various kinds. In September he was able to go the country, but on Oct. 10th he came back sick of an illness which ran a similar but less severe course than that just described. In December he had another attack ; in March, 1884, another, almost similar to the first one, except that from the stage of delusions he took four months to recover. These delusions were so constant, so organised into the daily life of the patient, that the case presented itself to some of the various consultants who saw him as one of hopeless dementia, with the expansive ideas of general paralysis. Only in August was he fit to move to the country; while there he had an epileptiform attack involving the facial muscles for a few moments, and this recurred several times. In November, 1884, an attack began which lasted till the end of January, 1885; another during February, March, and April; another lasting three weeks in May and June. After a few weeks of convalescence he began again on the 23rd July to suffer from headache, mainly on the right side and in the right eyeball. After a fortnight of this, he fell into a coma which lasted six days; then came gradual awakening, with gradual development of speech,

and a period of delusions which lasted three or four days. During all the attacks in which I saw him—and I think I saw all but one—the breath was peculiarly fœtid. During the attacks of 1885 the usual medical adviser of the patient was constantly ill himself, and unfortunately died early in 1886; so that from early in 1885 I began to be largely and increasingly responsible for the charge of the patient. The treatment up to this time had consisted for the most part in the administration of grey powder or calomel and opium for headaches and during the pre-comatose stage of illness; stimulants during coma; sedatives, mainly bromides, afterwards. There was in the mind of my senior a constant struggle between two theories of this patient's disease, one or other of which held sway according to the gravity of the case for the moment; one of these was that of a congestive meningitis or cerebritis—the other, that of hysteria. I mention this, because it helps to crystallise the varying morbid conditions which it presented.

The patient had an attack early in the autumn of 1885, in which I noticed during several days tonic contraction of the left forearm, left hand, and of the thumb into the hollow of the hand—a sufficiently suggestive phenomenon when associated with a headache, which, even though it was often general, seemed always to affect the right side more severely than the left. Shortly after the conclusion of this illness, at the end of August, 1885, I had an opportunity of questioning the patient's wife minutely—feeling, as I did, that something had yet to be discovered to account for the fact that an apparently healthy man should have about every three months an illness lasting about six weeks, which threatened to bring him to a lunatic asylum, if not to the grave. Amongst other facts I elicited one which I had for some short time been guessing at as the source of the trouble—namely, that he was in the habit of using a hair-dye, and that the habit dated from before his first attack. Whenever he recovered sufficiently to move about and receive visitors the dye was brought into requisition. I had the "hair-restorer" analysed, and it was found rich in lead. I now asked its use to be discontinued; saying that if my suspicions were correct, I hoped that the attacks would gradually become less severe, and the intervals longer, and that bye-and-bye, perhaps, recovery would be more or less complete. I said "more or less," because the patient's condition had become by this time a miserable one. He never knew at what instant the fatal headache would seize him and render life unbearable till kindly stupor almost anni-

hilated him. He walked with an ataxic gait; the knee-jerks were absent; he had tremors in the arms, especially the left; his sight had failed a good deal; he could neither walk nor read with pleasure. The heart was healthy, but feeble; the urine at no time contained either albumen or sugar. Dr. Fitzgerald examined the patient's eyes for me, and found no ophthalmoscopic evidence of disease.

The subsequent history of the patient may be looked on as an interesting involution of his previous course. In March, 1886, he had the first attack after giving up the hair-dye—an interval of five months. It lasted a shorter period than usual, and there were headache and delusions, but no coma. I did not see the patient during this attack.

The patient shortly after this came wholly under my care, and has remained so since. He had a new attack about Christmas, 1886, which speedily passed off and was mainly characterised by headache. In March, 1887, while in church, he was conscious of some odd feeling creeping over him, and of a foul odour, as it were, in his mouth. His wife noticed that he stared for a few moments before him. She tells me that he has had a similar attack, which I will call an "ill-odour fit," about ten times during the past year. He complained to me that he sometimes gets a headlong impulse in his thoughts, so that, for instance, when playing cards, which he was again able to do, the mention of a number sometimes set him counting to the extent of forgetting the game. In April, 1887, he had a convulsive seizure involving the left side, accompanied by unconsciousness and followed by drowsiness. Next month, I observe by my notes, the ill-odour fits continued. Depressing ideas, with temptations to self-destruction, which had more or less asserted themselves since the great attacks became fewer, now troubled him so much that I feared the development of melancholia. In September I note that he has a somewhat drunken gait, with tendency to walk to the left of the intended course. Attacks of *petit mal* average about two weekly, but the ill-odour aura is less marked than formerly. The left hand is deficient in the sense of touch, so that he readily drops any article held in his left hand unless he keeps looking at it.

I have now no note till November, 1888, when the record stands as follows:—"Has been very well during past year; melancholic tinge almost gone. *Petit mal* not oftener than every third month; headaches gone for past four or five months. Power and

sensation in left hand normal (has not been dropping things); sleeps better; takes daily walks of several miles by himself and in company." And I may add that his sight is as good as it should be at his age.

This patient comes to see me from time to time to show me how well he is. Momentary attacks of *petit mal* occur now and again—perhaps once every two or three months. I have attempted to make out whether bromide of potassium had any effect in warding them off, and neither I nor the patient's wife, who has no lack of faith in drugs, has ever been satisfied that it did. Looking back over the long course of treatment which he has undergone, I find that opium, calomel, and iodide of potassium, were the drugs which were most constantly resorted to, and they appeared most to deserve our confidence.

This case is then a mixed case of delirium, coma, and convulsions; the last phenomena not severely marked. It illustrates for the first two and a half years the regular occurrence of encephalopathy after a certain dose of the poison; and for the remaining period a constant decrease in, and loss of symptoms, till now nothing remains except an occasional and almost imperceptible attack of *petit mal*. But it illustrates very forcibly the difficulties in diagnosis which such a case may present—difficulties which are a hundred times magnified for the consultant who sees such a case for only ten or fifteen minutes, and sees it under the bias given him by the ordinary medical adviser. A consultant might have seen this case when it resembled nothing but migraine; another when it looked like commencing locomotor ataxy; another when it looked like cerebritis or meningitis; another as a case of acute mania, or one of melancholia with dangerous tendencies, or as an example of general paralysis of the insane.

My next case is one which can hardly be set down as an example of encephalopathy in Tanquerel's sense; but I submit it as a case which was leading up to that condition, as well as, probably, to other disorders; and as an example to

justify a larger expansion of that term than that which Tanquerel and subsequent writers have given it.

Case II.—A gentleman, like my first case, in the Civil Service, over sixty years of age, with no previous history of gout, nor any family tendency to it, had what was taken to be a gouty attack in the metacarpo-phalangeal joint of the right thumb. A year or two later, in December, 1888, he was suddenly seized with weakness in the left hand and left leg, accompanied by a momentary unconsciousness or fogginess of intellect. The weakness was practically gone in twenty-four hours, when I saw him. The heart was very irregular and the urine gave a trace of albumen. On the 7th of January, 1889, the right hand became slightly paretic. I regarded the case as probably one of early renal cirrhosis or of cardio-vascular degeneration; but as I knew the patient was using a hair-dye I forbade its use, and took a sample of it, which was analysed for me by Professor Lapper. He informed me that it was a strong solution of lead, and I thereupon repeated my advice that it should be used no longer. I could not be positive that lead had been in any measure responsible for the gouty joint, the albuminuria, or the pareses, but I was sure that it might intensify any of the tendencies which these phenomena indicated. For some months after this attack the patient, in writing, had some visual amnesia. An accurate speaker and speller, he now frequently wrote one word for another and made slight slips in spelling. This was associated with a slight degree of diplopia and amblyopia, which prevented his reading, and for which, later on, I had him examined by the late Mr. D. Redmond, who informed me that there existed no evidence of any ocular defect other than normal presbyopia. Gradually the patient's writing became more accurate; he enjoys his newspaper; there has been no return of paresis anywhere; the heart is now regular, except for a rare intermittence not out of keeping with his age; the urine is normal, and the patient has within the past year passed through a severe attack of influenza—a trying test for any marked renal or cardiac degeneration, if either existed.

We have here recurring motor and probably sensory pareses passing off within a reasonable time after the disuse of a lead-containing hair-dye, and that at an age when morbid

tendencies, once set up, are prone to continue even after removal of their cause. The two cases just related are proof, if such were needed, that, contrary to Tanquerel's opinion, lead, like mercury, may be absorbed through the intact epidermis.

Case III.—M'C., a hard-working Scotch plumber, aged thirty-eight, for a month or two before admission to hospital showed some jealousy of his wife; about ten days before admission complained of headache and loss of memory; got out of bed on January 10th, 1892, and fell on the floor. When his wife came to him she found that he had passed water on the floor, that he had lost his speech, and that the right side was paralysed. He was brought to the Whitworth Hospital on the 14th of January. His subsequent history is as follows:—

Jan. 15th.—Can tell his name; can say the first seven or eight letters of the alphabet, and then tends to repeat H or J indefinitely. The speech is slightly tremulous. There is twitching, at the rate of about sixty times in the minute, in the muscles of the right cheek, lower eyelid, right side of nose and upper lip, in the right pectoral muscles, and in the right arm, forearm, and fingers, and in the right thigh, calf, and peroneal muscles. He can obey directions, such as to put out the tongue, look to one side, and so on; and names a chair, a bottle, pen, and two-shilling piece when his attention is concentrated on them. The right pupil is very slightly larger than the left; both accommodate for light and distance. The movements of the eyeballs are perfect. He sees well, but does not catch and follow an object presented on his right side, and does not see it till it passes the middle line to the left. No tenderness on percussing the scalp. There is apparently full power in the left arm; he can barely raise the right arm off the bed. Similarly with the legs; left leg normal, the right is raised with difficulty and after much exhortation, and is dropped soon. The general muscular system is well developed. The plantar reflexes are present, but dull. Knee-jerks equal and almost increased; no ankle clonus. The breath has a fœtor like that due to mercury; the teeth and gums are remarkably healthy; no lead line on the gums. The urine drawn off by catheter thirty hours after admission having been retained till then, was acid, of specific gravity 1030, and contained neither albumen nor sugar.

16th.—When put in the erect position to-day he cannot stand without support. His weight is thrown upon the left leg; the right leg is held close to the left, and the foot is held inverted. Has incontinence of urine and fæces.

18th.—The twitchings gone to-day. Incontinence of fæces ceased to-day, and constipation succeeded. The diagnoses offered to the class at this stage were three—namely, an unusual form of general paralysis of the insane, syphilitic disease of the brain or its meninges, and lead-poisoning of the brain. There were no marks on his body suggestive of former venereal disease, but he was put on mercurial ointment and iodide of potassium as a diagnostic measure.

21st.—The breath still fœtid, and the gums being now sore, the mercurial ointment was discontinued. There is marked improvement in the grasp of the right hand, and the right leg can be drawn up or raised completely off the bed. He can say the "Our Father," when helped, off perfectly; but is still inclined to repeat a previous impression, as to say the alphabet a second time when bidden to say the "Our Father." A curious disturbance of sensibility was noticed on this date, but circumstances allowed it to be better defined on the 27th of January, as follows:—

27th.—When asked to catch his beard, nose, ear, or moustache, he mistakes one of these for another, or a fold of the bedclothes for any of them; and this with his eyes open. Thus for his nose he catches the malar prominence; for an ear he catches perhaps his shoulders or the bedclothes. He frequently shows a tendency to reverse sides (allocheiria), both in act and speech; thus, while he can wink with the right or left eye as directed, he maintains that he can rub his chest better with his right hand, and on being bidden to do so uses his left. A similar condition is present in the legs.

30th.—With his eyes shut he can name a coin after manipulating it with his left hand—not so with the right hand. He has a fair idea of the position of places where he is touched on the left arm, but is quite at a loss on the right arm. In the legs he constantly reverses the names right and left.

Feb. 3rd.—To-day he counts to fifty, says the alphabet and "Our Father" accurately, and is able to give a good account of himself. He says that he has been working in country houses in the county of Cork, largely at lead-roofing; also that he has been a teetotaller for the past eight years, but used to drink heavily before that time.

11th.—Appeared almost well this morning up to noon. Shortly afterwards it was noticed that he could not speak, and between this and 8 p.m. he had twelve general epileptiform attacks, in which the left side was, however, most engaged; there was right conjugate deviation of the eyes.

12th.—Fewer fits than yesterday, but his head kept moving from side to side, and his hands were in a state of spasm most of the day.

14th.—The eyes are drawn upwards and to left, with frequent winking. Speaks fairly rationally, can count and say the alphabet, but stops short in the "Our Father." He has some paresis in left arm and leg.

15th.—The right leg can be drawn up in response to exhortation supplemented by slapping; the left is not moved by any stimulus. He does not move the left arm when ordered, though later on it is held out while he sings. Whilst under observation to-day the right leg is frequently drawn up and strongly adducted. The eyes are deflected to the right, and the head is more or less constantly turned a little to the right. He states that he has no pain; he keeps up a somewhat musical drone. When asked he sings, in a somewhat broken voice, "Weep not for me, dear mother," "Champagne Charlie," and portion of "Auld Lang Syne;" during the singing all convulsive movements disappear except an up-and-down motion of right knee and the right conjugate deviation. There are several bullæ on the back of the left thigh.

16th.—To-day he is lying without spasm, though the head is retracted and buried in the pillow, so as to suggest a strong contraction of the posterior muscles of the neck. He speaks intelligently and attempts to obey orders, but seems to have little or no sensory guide in doing so. Common sensation and the muscular sense seem equally deficient. As before, he is quite unable to touch his nose, his elbow, or his beard; he will hold on to his lower eyelid and call it his beard or ear with equal complacency. His movements are accompanied by a histrionic expression which would make his failure of achievement ridiculous were it not so pitiable. Thus, asked to squeeze my hand, he acts with mouth and body the giving of a vigorous squeeze, while his hand is merely closed on itself. Asked to look at an object, he fixes his gaze and strains, but apparently sees nothing—nay, when asked to grasp his nose tightly, though it is his elbow or the blanket which he holds, he speaks for the moment "through his nose." There is no squint to-day, the pupils quite central.

18th.—To-day conjugate deviation upwards and to left; the eyes follow the movements of the head, but always return to the squinting position. He sings well to-day. He volunteers to dance a hornpipe for us, accepting the suggestion that he is standing on the floor; but as he does not find his efforts resulting in a dance, he thinks of the explanation that his trousers are too tight for dancing.

22nd.—Is able to-day to name a key, a hand, a handkerchief, and other objects held before his eyes, but throughout the whole course of his illness he sees nothing in the right visual field. I was able to examine his eyes one day, not recorded in the notes, and could find no evidence of optic neuritis or atrophy. The condition of the patient up to this may be summarised as follows:—Epileptiform attacks at admission and four weeks afterwards; right hemianopia; cheerful disposition without delusions as to his personal history or capabilities; certain spastic or paretic conditions of ocular muscles and of limbs, varying from time to time, and great disturbance of common sensation, in so far at least as it is an adjunct to muscular effort. I pass on to the 21st of March.

March 21st.—Right pupil larger than the left. He cannot sing so well as formerly; he counts well, but spells not so well as formerly, tending now to phonetic forms. He accepts any sensori-motor suggestion, as that he is playing the banjo—he takes the edge of the sheet and calls it the strings; his left elbow is the body; a pinch out of his shoulder is, he says, the bridge; but when no sound comes he confesses that he cannot remember how to play the instrument. He is hurt when I pull the hairs on his forearm, but he cannot tell where I hurt him or what I am doing. He is able to judge between heat and cold; and seems to turn towards those speaking to him more than he did formerly.

On the 31st of March he had a series of epileptiform attacks like those previously described. The temperature, what had previously been normal, rose this evening to 105·8°. The fits lasted about four hours.

Next day, April 1st, there was right conjugate deviation of the eyes; pupils not accommodating for light, and moving from side to side through perhaps two or three millimetres; limbs flaccid; breathing stertorous. The temperature varied from 100·5° to 101°. He died early on the morning of April 2nd.

The autopsy was made about four hours after death. Body well nourished; no external signs of syphilis; two or three bullæ

on the feet at pressure points. Thoracic and abdominal organs apparently quite healthy. Calvarium easily separated from dura mater; no signs of fracture or necrosis or other disease of skull, except that it seemed unduly thin and transparent at a Pacchionian depression behind the coronal suture to the left of the middle line. On removing the dura mater the arachnoid is seen to be somewhat distended by fluid, the convolutions are pressed apart, and at some places in both hemispheres, but more especially in the left parietal lobe, a cystic appearance is produced by more or less globular collections of fluid between the arachnoid and punched-out-like depressions in the cortex (see Fig. 1). No sign of hæmorrhage or meningitis. The brain, with adherent arachnoid and the contained fluid, weighs 40 ounces.

Spinal cord: a good deal of fluid about it, which about the lower dorsal region has almost dissected the chief columns apart, much as in the brain it separates the convolutions.

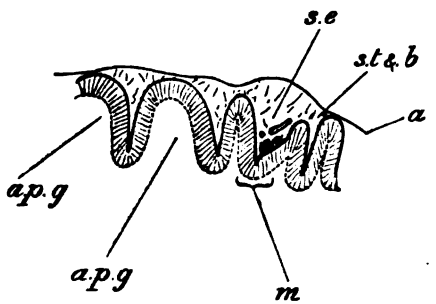

Fig. 1.

Rough sketch of section of cortex of parietal region of brain, parallel to and 1½ inch to left side of longitudinal fissure. *apg*, ascending parietal gyrus; *m*, place from which microscopic sections are taken; *a*, arachnoid; *st* and *b*, subarachnoid trabeculæ and blood-vessels; *se*, subarachnoid effusion depressing underlying convolution.

Professor Lapper very kindly undertook an analysis of some of the organs for me, and reports the result as follows:

"I have completed the analysis of the portions of liver and kidney you sent me. I have found traces of lead in the liquid in which they had been preserved, and after washing free from the liquid I discovered small but unmistakable traces of lead in the liver and kidney. I have found more than a trace of lead in the cord."

Dr. H. C. Earl made a histological examination of a portion of a convolution which was depressed by the effusion, and he supplies me with the following statement:—

"There is no atrophy of the nerve-cells or nerve-fibres of the cortex. There are, however, certain appearances in the sections which are very remarkable. In the deeper part of the cortex the neuroglia-cells are deeply pigmented, of a dark brown or black colour. Both the body of the cell and its processes are thus affected, the cells presenting almost exactly the appearance that they do when stained by corrosive sublimate after the method of Golgi. The region in which the cells are thus affected is limited to a comparatively small part of the sections. In the same area the capillaries are pigmented in a similar way to the cells. Their walls are brown or black, with here and there non-pigmented portions and oval black masses, which seem to be the nuclei of the endothelial cells, are to be seen at intervals. The capillaries in some places appear to be blocked up with masses of pigment, but of

Fig. 2.

Section of cortex under lower power (Leitz 2, ocular 1), showing patch of neuroglial and capillary pigmentation. The large vessels shown are not pigmented. The non-pigmented capillaries do not appear in the section.

this I am not quite certain. I am unable to come to any conclusion as to the nature of the pigment."

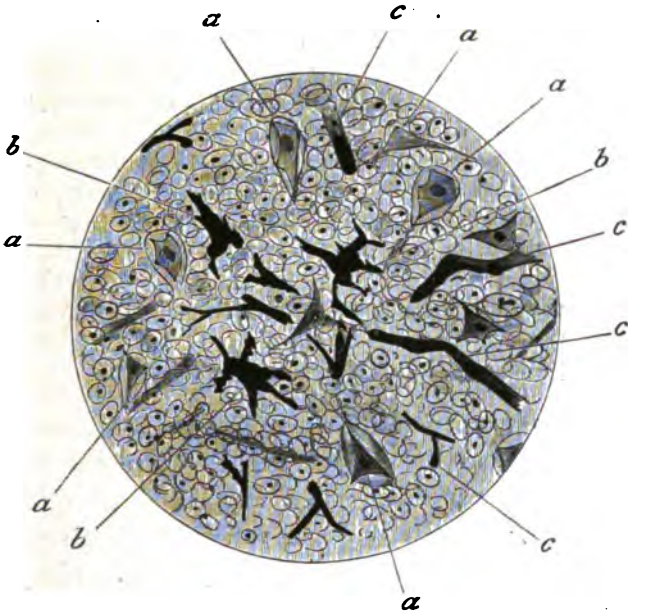

Fig. 3.

Section of cortex under high power (Leitz 7, ocular 1). *a*, nerve cells; *b*, neuroglia cells; *c*, capillaries, some apparently blocked with pigment, others brownish with deeply-pigmented nuclei.

Figs. 2 and 3 illustrate the appearances of the sections prepared by Dr. Earl.

I have detailed the preceding case at greater length than was perhaps necessary for my main purpose, because it seemed to present a rare combination of sensory, motor, and mental phenomena. To recall but one of the difficulties which it presented: how are we to explain the fact that a man, with eyes open, names a pencil, knife, or hand presented to him, and takes a coin and feels it well, and names it rightly a florin or a shilling, and at the next moment catches a fold of the bedclothes and calls it his nose?

Case IV.—My last case is that of a house-painter, admitted to the Whitworth Hospital on the 23rd of last September (1892). He suffered from lead colic six years ago, and again a year and a half ago. He had on admission a well-marked "blue line" on the gums, but it has since gradually disappeared. He complained of severe and constant parietal and occipital headache, which, he said, was "driving him mad." The headache still continues, but is less severe and more confined to the occipital region than formerly. Three weeks after admission, and while taking iodide of potassium, he had a general epileptiform seizure, in which the head and eyes turned, in the early portion of the fit, to the left. That is the only epileptic attack of which I can get any history. He has some albuminuria, notwithstanding which he is taking, with concurrent improvement, two drugs which ordinary subjects of Bright's disease bear badly—namely, iodide of potassium and opium.

I venture to put forward a classification of the symptoms of saturnine encephalopathy which will have the merit of simplicity, only premising that any combination of such symptoms and a wide range of variability in the mode of onset and the progress of the case are possible. The phenomena may be—

A. Motor—general or partial in extent; paretic or convulsive in character.

B. Sensory—local or widely diffused; common or special in character.

C. Mental—difficult to be classified, but usually falling under one or more of the following forms:—

a. Hysterical.

b. Delirious, simulating acute mania; quiet or furious in character.

c. Delusional; presenting types akin to chronic delusional insanity; general paralysis of the insane, or melancholia.

d. Stuporose or comatose.

This classification broadens out the signification of saturnine encephalopathy so as to include, as it ought to do, all

the phenomena of cerebral poisoning by lead, whether the disease stands out as a distinct individuality, as in Tanquerel's case, or manifests itself, for instance, in a general paralysis indistinguishable from that ascribed to syphilis or intemperance, or a transient hemiparesis such as occurred in my second case. On the other hand, it would not be applicable to head symptoms only secondarily associated with lead, such as a cerebral hæmorrhage resulting from vaso-renal degeneration caused or accelerated by chronic plumbism. I had under my care a few years ago in the Whitworth Hospital another Scotch plumber, who, about a fortnight before, had fallen in a fit while working on a lead roof in a country house, and who presented the typical mental picture of general paralysis. He went from me to the Richmond Asylum, and I believe ran the ordinary course of the general paralytic. I have no proof that his condition was due to lead-poisoning, but I think it was at least as likely to be the cause as those one usually looks for. He was an elderly man with grown-up sons, was not a heavy drinker, and was in constant work and therefore in constant contact with lead. Whatever the cause in this case, lead-poisoning is a well-recognised cause of general paralysis, and I have shown by my first case that it may set up a pseudo-general-paralysis and a transient melancholia, from which recovery may ensue on withdrawal of the cause. Clearly, if general paralysis or melancholia be producible by lead-poisoning, these conditions, when so produced, must take rank under the general term encephalopathy.

When, in persons who have been in any way subjected to the influence of lead, any group of symptoms, such as I have detailed, present themselves, without other readily ascertainable cause, the physician should ask himself whether lead is *the* cause, and even though he be unable at once, or perhaps at all, to decide the question, he will, in the majority of

cases, be safe in forbidding further contact with lead. For even though lead be not the prime agent in producing the morbid condition, one is justified in suspecting that it will be likely to aggravate it.

For the diagnosis of a lead-causation of cerebral symptoms, a course of iodide of potassium will be of use, though it is subject to two disadvantages—it may, for a time at least, make the symptoms worse, and it does not help us to eliminate the suspicion of syphilis. I need hardly add the truism that even if the symptoms seem to be bettered by the iodide, and even if syphilis be completely excluded, it by no means absolutely follows that they were due to lead.

The aim of this paper has been to draw attention to a condition which is hardly noticed in the ordinary text-books, but deserves nevertheless to be kept in mind when dealing with obscure cerebral cases. I have not attempted to make any original suggestions as to its pathology, but I may say that in sections made by myself of the brain of my third patient I noticed that some of the peri-vascular lymph-spaces were full of blood corpuscles, while others had none. This fact, taken in connection with Dr. Earl's observation on the same case, may hint at a direct influence of lead or some lead-product on the smaller vessels and the neuroglia surrounding them; the process occurring irregularly over the cortex, and thus occasioning the inconstancy and atypical character of the symptoms. It goes without saying that I do not maintain that *all* the symptoms noticed in my cases were of *cerebral* causation. I only desire to draw attention to the predominance of the brain symptoms.

Dr. LITTLE considered the interesting paper they had just heard should remind the members of the necessity of not forgetting lead-poisoning as a possible cause of otherwise inexplicable nervous

symptoms. He mentioned the case of a gentleman who some years ago consulted him for a headache. He (Dr. Little) failed to relieve him, but subsequently heard that the patient lost all his headache when, acting on the advice of a hairdresser, he gave up the hair-dye he was in the habit of using.

Dr. Falkiner said that the principal substances which were used in hair-dyes were nitrate of silver, pyrogallic acid, and acetate of lead with sulphur. He had discovered that nitrate of bismuth—a body insoluble in water owing to the formation of the sub-nitrate—was soluble when rubbed up with glycerine. This substance dyed hair a beautiful rich black.

Mr. Doyle wished to ask Dr. O'Carroll what were the colours produced by the dyes his patients had used. One of his patients, who had symptoms of neuritis and delirium, used a hair dye which stained the hair of a bluish tint, and which on analysis was shown to contain copper. On ceasing to use the hair-dye the patient recovered.

Dr. H. C. Tweedy asked Dr. O'Carroll did he not think it a remarkable thing that the patient who stopped using the hair-dye in 1886 should up to the present have occasional mild attacks, and that the poison should have taken such a length of time to be eliminated. He wanted to know whether there was any way in which lead might still be absorbed in his case, or whether the later symptoms might have another cause.

Dr. Quinlan said he had seen a case like one of Dr. O'Carroll's. In this case infection was caused by the use of a lead comb, and the symptoms disappeared after the comb ceased to be used.

The President mentioned the following two cases which had come under his notice. In the first case saturnine symptoms were present. The patient was a manufacturer of sugar-sticks, and he used chrome yellow in preparing them. Thus the introduction of lead into his system was accounted for. The second case was that of a man who had become incapacitated for his duty, and who was pensioned off on account of a diagnosis of lateral sclerosis. Dr. Smith noticed he had a blue line on his gums. He also found out that the man had a habit of constantly chewing a pellet of lead. Slow absorption took place, and he developed spinal symptoms. He was treated with iodide of potassium and magnesium sulphate, and got well. Dr. O'Carroll, in his paper, made no mention of the spinal cord or the peripheral nerves being affected. Lead and other elements of high atomicity, such as silver, mercury, and

arsenic, are very poisonous to the nervous system; they act as protoplasmic poisons. Silver and lead are in many respects analogous. Both form dense albuminates with the tissues, but there is this point of difference—the silver albuminates are insoluble in chlorides and also in lactic acid, while the lead albuminates are soluble in the alkaline and acid fluids of the body. On account of this lead-poisoning is more easily caused. The lead is a direct protoplasmic poison, and a little metallic poison does a great deal of mischief in the brain. Of late years a certain quantity of lead has been in some cases abstracted from the cerebrum and cerebellum. The metal forms a direct combination with the albumin. Another proof of its direct action on the nervous elements is shown by histological examination, which reveals certain pigmentary changes. In addition to this, there are certain bad effects on the general health. These two things are sufficient to account for the seriousness of the phenomena and also for their instability witnessed in cases of lead-poisoning. As regards treatment, iodide of potassium does no real harm by increasing the solubility of lead already deposited in the system. The quantity is very small, and the increased quantity in solution for a couple of days would not signify. Lead is not excreted by the kidneys to any practicable extent, but it is excreted by the intestines, and it is very liable to be reabsorbed. Consequently, it is always well to combine with the iodide of potassium a saline purgative, such as magnesium sulphate.

Dr. O'Carroll, in reply, said that he did not know whether copper was present in the hair-dyes his patients had used. The colours produced by them were the ordinary colours. In reply to Dr. Tweedy, he quoted described cases in which the patients had recurrent attacks several years after removal from all chance of infection. Might not some structural changes, or some functional habit, have been produced from which it would take a long time to recover? In reply to the President, he said that, in accordance with the title of his paper, he had been laying stress on a cerebral lesion, and did not mean to give a complete account of *all* the nervous lesions attributable to lead.

CASES OF GLAUCOMA IN YOUNG PEOPLE.

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[Read in the Section of Medicine, December 16, 1892.]

PRIMARY glaucoma before middle age is of such rare occurrence, that the following cases observed in individuals between the ages of thirteen and thirty-five, are worth recording. The first case is not one of primary glaucoma in the strict sense of the term:—

CASE I.—*Acute glaucoma after subconjunctival injection of cocain in a girl of thirteen.*—Miss Nina M., aged thirteen, has been under observation for some years. She suffers from convergent strabismus and hypermetropia. In May, 1890, the tendon of right internal rectus was divided under cocaïn anæsthesia. A 3 per cent. solution of hydrochlorate of cocaïn was used in the following manner:—Three or four drops were first instilled into the conjunctival sac, and then somewhat less than 2 m. was injected subconjunctivally over the insertion of the internal rectus. Her pupils at the time were widely dilated by atropine used some hours previously.

Some two hours after the operation I was sent for in haste to see her, and found her suffering from acute glaucoma, intense pain, and photophobia, several attacks of vomiting, T. + 1 or + 2, and pupil more dilated than at the operation. The pain was too great to admit of ophthalmoscopic examination. Frequent instillation of eserine made her all right in about two hours more, driving away the pain, reducing T. to normal, and contracting the pupil to about half its former size.

About one month later I tenotomised the left internal rectus. This time no atropine was used at all, and 2 m. of eserine were instilled at the time of the operation to counteract the mydriatic action of the cocaïn, which was used as on the former occasion. In spite of this precaution an attack of acute glaucoma came on some two hours after this operation also. Intense pain and

vomiting; T. + 1 or + 2; pupil at maximum dilated towards internal side only, *i.e.* the side next the situation of the subconjunctival injection of cocain. It took 4 m. of eserine every quarter of an hour to cure this attack of glaucoma, which lasted for one hour.

The horizontal diameter of cornea in each eye was 12 mm. and the refraction under atropine was (by retinoscopy) R., + 5 D. + 0·5 cyl; L., + 4 D + 3 cyl.

CASE II.—*Chronic Inflammatory* (?) *glaucoma in a woman of eighteen*—Mrs. H., aged eighteen (H. C., 696, March, 1890). The history given by this patient was merely that she had been married one month, and that her eyes failed subsequently, with pains in the balls. She allowed on a subsequent examination that she had noticed blue rims to lamps so long ago as Christmas. The only account that her family could give of the disease was that it came on within one week of her marriage, and that she had desired to marry some man other than the bridegroom!

The case was a typical one of glaucoma. T. + 2 in both eyes; dilated and tortuous anterior ciliary vessels; pupils wide, the media clear, discs deeply excavated. Left pupil reacted slightly, the right not at all.

Vision: right eye = hand reflex in temporal field; Left eye = fingers at 0·5 m. in temporal field.

March 15th.—Large sclerotomy upwards in right eye, the iris being accidentally pricked by the point of knife, reduced T. to − 1, but left a large hyphæma.

March 16th.—Sclerotomy upwards in left eye.

March 18th, Tn. in both.

March 20th.—Both pupils found more dilated than on 19th, in spite of eserine, and the hyphæma in right eye larger. T. approximately normal in each, tending to + in left and − in right. Vision unaltered by the operation.

March 24th.—Right T. — 2, hyphæma unchanged. No ophthalmoscopic illumination. Left disc deeply cupped with a few minute hæmorrhages under the temporal edge of disc spreading into retina. Marked atrophic ring round disc. By erect image, edge of disc — 12; bottom of cup — 20, but this examination was made while eye was well drugged with eserine. It took on all occasions a liberal use of eserine to produce any effect at all upon either pupil.

March .—Hyphæma in right less, and disc visible, but the hyphæma was not completely absorbed in this eye even on March 31st, on which day we could see that a small prolapse of iris had occurred through the inner scleral incision.

The patient went home on April 2nd, with vision the same as before operation in each eye. Right T. + ? Left Tn. Refraction by erect image in right eye; edge of disc — 3; bottom of cup — 8. In left eye edge of disc — 4; bottom of cup — 8. Corneal diameter 12·5 mm. by Priestley's Smith's keratometer.

Patient seen again Feb. 15th, 1892.

R. Tn. Small hernia iridis, due to sclerotomy. V. = hand eflex in temporal field. Priestley Smith's tonometer = 0.7 mm. L., T. + ? V. = fingers at 2 m. Field very contracted as tested by fingers; nasally quite up to fixation point. Both pupils act. L. deciphers Wecker's type, No. 8; erect image; R., edge of disc — 5; bottom of cup — 8; L. edge of disc — 2 and — 3; bottom of cup — 6.

In contrast to these two extremely exceptional cases, I have made notes of two other cases of glaucoma, which are remarkable for the youth of the individuals affected—one a woman of 35, and the other a man of 30. This last case is also noteworthy, inasmuch as the patient's mother also suffers from the same disease.

Case III.—*Acute glaucoma in a woman of thirty-five.*—Mary A. G., aged thirty-five (D. C., 2,715, September, 1891). Complains of pain and much dimness of vision in her left eye for only two months. She had been treated (so far as I could make out, most injudiciously) by a distinguished surgeon in one of the Dublin hospitals. Her right eye was healthy. Left exhibited circumcorneal vascularity, dilated and tortuous anterior ciliary vessels, a hazy cornea, a dilated rigid pupil, a discoloured iris. V. = p. l., T. + 2. No details ophthalmoscopically visible; no effect produced on pupil or tension by a liberal use of eserine. Cornea obviously small, judging by the naked eye, but its diameter equalled 11·5 mm. by Smith's keratometer.

Case IV.—*Chronic inflammatory glaucoma in a man of thirty.*—Mr. B., aged thirty, November 16th, 1892; has been wearing a convex cylinder, prescribed some five or six years ago by the late Mr. Redmond, for his left eye. This eye is weak and loses its sight every day towards evening. With correcting glass V.

= 5/10? R. eye, V. = 5/7·5, and imperfectly = 5/5. His mother has noticed his left pupil getting big at the times when his sight is dim. He sees no coloured haloes. Slight chronic conjunctivitis on both sides, very shallow anterior chambers, and quite microphthalmic looking eyes; corneal diameter = 11 mm. R. and L. Tn. R. and L., as also fundus. Venous pulsation in left disc. Ordered boric acid and nitrate of pilocarpine.

December 3rd.—He returned to say that he has an attack to-day—the second since using the pilocarpine, which has evidently done good, as the attacks were previously of daily occurrence. L. pupil wider than right. T. + 2. Tonometer measurement = 0·4 mm. (while right = 0·6 mm.). Left fundus exhibits both venous and arterial spontaneous pulsation—a phenomenon I do not remember to have ever seen before. The arteries—the larger ones—empty with a sudden jerk, then fill again immediately, and remain full till they empty, or rather diminish their diameter, with a sudden jerk again. I found it very difficult to accurately compare the venous and arterial pulse. The vein only pulsated at one spot, just as it crossed one of the large arteries in the bottom of the disc, and from the arrangement of the vessels, and the impossibility of seeing down to the very bottom of the deep physiological (?) cup, it was impossible to be certain of the exact cause of the phenomenon. The portion of vein pulsating was posterior to the subjacent artery, *i.e.* it was a portion of vein lying between that artery and the place where the vein passed out of the globe. It is hard to understand how any pulsation could be produced in that part of the vein by the action of that particular artery, and I would attribute the venous pulsation, not to the action of that artery, but of one lower down, nearer the exit of the vein, and ophthalmoscopically invisible, or to the nipping of the vein by some fibrous tissue as it passed through the lamina cribrosa. This much I was able to satisfy myself of—that the filling of the artery (and, therefore, of all the arteries) immediately preceded the filling of the vein. It looked as if the pulse-wave in this artery dilated the cavity of the vein. The vein only pulsated at this spot—deeper down than the spot where it touched the artery. The larger arteries pulsated both on the disc and for some distance also in the surrounding retina in the same jerky way described above. No pulsation visible in right retina.

December 4th.—After using eserine last night and this morning pupil contracted. Tn. (tonometer = 0·7 mm.) and symptoms of

coloured haloes round lights and dimness of sight quite disappeared. He had these haloes on this occasion for first time. Pupil too small for thorough ophthalmoscopic examination, but so far as can be seen no pulsation present in retinal vessels.

An interesting point about this case is that the patient's mother has one eye blinded by glaucoma, and has chronic inflammatory glaucoma in the other one. I saw her during her second attack in this eye.

Since reading these notes, Mr. B. has been seen again, on February 1st, 1893, when he presented himself with an attack of a novel description. He had had no attack since December 3rd, and had used pilocarpine drops daily till January 30th, when he forgot to put them in. That night he got an attack exactly in his opinion like the one of December 3rd, but it has continued ever since unabated, except in one respect, that the pain which marked its commencement has subsided. The eye (the left) looked just as on December 3rd: zonular vascularity; dilated pupil; V.= 5/30, disc slightly hazy, but cornea clear, with no keratitis punctata; very shallow anterior chamber, no visible pulsation, and, to my astonishment, T. — 1. Next day V. rose to 5/15, but T. remained — 1.

The notes of the following case also have been added to since this paper was written:—

Case V.—*Chronic Inflammatory Glaucoma in a man aged Thirty-four associated with Keratitis Punctata.*—Mr. R. consulted me on December 3rd, 1892, complaining of fog before his right eye and a rainbow halo round lights. He had suffered from attacks of this description for some weeks, and was in all other respects a strong healthy man. R. eye V. = 5/15 ?. T. + 1. Tonometer = 0·5 mm. L. eye V. = 5/7·5 ??, Tn. Tonometer = 0·6 mm. Corneal diameter = 12·5 mm. right and left. Both pupils active, anterior chambers normal, discs deeply excavated. Right cornea hazy, but no keratitis punctata or iritic exudation visible, although most carefully searched for. Visible arterial pulsation in this disc, none

in the other. Anterior ciliary vessels large in both eyes, and pupil of right slightly larger than that of left.

December 4th.—Right pupil contracted by eserine, vision with $-0{\cdot}5 = 5/7{\cdot}5$—the same as that of left eye. Tn. in both. He says that the fog has been present off and on for more than a month, but that he believed it was caused by over indulgence in alcohol and tobacco.

December 7th.—Is worse to-day, and left eye also affected; sees coloured haloes before both eyes. Both corneæ hazy, but no keratitis punctata visible. T. + 1 in both. Right pupil contracted, so that pulsation of vessels of retina cannot be seen, but left disc exhibits spontaneous venous pulse and easily induced arterial pulse.

December 8th.—Both pupils contracted by eserine. V. = 5/5 ? in each eye. Tn. Tonometer = 0·6 mm. and corneæ clear. This happy state of affairs continued unchanged for a week while using eserine, and for nearly a fortnight after discontinuing the myotic.

About Christmas time he got an attack in London, and consulted Mr. Tweedy, who kindly wrote to inform me that there was serous iritis in both eyes, and secondary glaucoma in the right. This attack passed off under the action of eserine, and he remained well till January 9th, when the right became again affected. A fresh attack occurred on January 13th, and on January 14th I performed a large iridectomy, using a Græfian knife on the right eye. Although the cornea was generally hazy during these attacks I could not detect any actual keratitis punctata or iritic exudation, therein failing to confirm Mr. Tweedy's observation. However, two days after the operation on right eye, the left got a definite attack of serous iritis and keratitis punctata, which passed off rapidly without increase of tension under the action of atropine, and the right eye exhibited slight keratitis punctata five days after the operation.

Six days after the iridectomy he was walking about with dark glasses, the eye practically well and vision good except that accommodation was paralysed by atropine. An unfortunate accident occurred then. During his sleep he let his hand fall on his right eye, and awoke with intense pain to find the eye completely blind. When I saw him at 4 o'clock a.m. he could not even see the light of a candle. The wound had been burst open, and the anterior chamber was full of blood clot. T. + 1. For four days afterwards I could detect no diminution in the blood clot; it then began to absorb from above, and perception of light returned.

After a week faint ophthalmoscopic illumination was perceived, and tension was normal. In a fortnight all trace of blood had disappeared. Tn. media clear; V. = 5/50. After another week V. with 2 cyl. = 5/10 Tn. During these three weeks the tension of left eye remained low, and it was kept under the influence of atropine with most satisfactory results. At the end of the time no trace of keratitis punctata was visible, the pupil being widely dilated.

The cases recorded above are interesting in many and various respects. Case I. is the first example I have met with of acute glaucoma produced by cocaïn in any form, and is, so far as I know, the first case in which an attack has been caused by a subconjunctival injection of this drug. It is remarkable, too, because of the youth of the patient, and the absence of any peculiarity in the eyeballs which could account for the attack—I mean such an abnormality as microphthalmos or unusually shallow anterior chambers. The little girl had been given a course of atropine drops to completely paralyse her accommodation on two former occasions without the slightest ill effects, and it is curious that the cocaïn on this occasion should produce the effect which it did. It is interesting, too, to note the very local action of the cocaïn on the iris of the second eye.

The second case, of primary chronic inflammatory glaucoma in a woman of eighteen, is one of extreme rarity. Primary glaucoma is a disease of advanced life, and the following cases of various kinds of primary glaucoma are mentioned in Græfe Sæmisch's "Handbook" by Schmidt as ophthalmological curiosities: (1) a girl of nine seen by Stellwag; (2) a boy of twelve seen by Schirmer; (3) a boy of sixteen, and (4) a man of nineteen seen by Mooren; (5) a woman of twenty seen by Peppmüller; and (6) a patient aged twenty-two seen by Schirmer. The youngest case seen by Priestley Smith ("Glaucoma," 1879) was a woman aged thirty-one,

and he refers (*loc. cit.*) to the case of a man of twenty-five reported by Critchett (R. L. Oph. Hosp. Rep., v. 224).

In Priestly Smith's paper on glaucoma in relation to age, read before the Ophthalmological Society in 1886, and based on the records of 1,000 unselected cases of primary glaucoma observed by himself and others, it appears that only five persons out of the 1,000 were attacked by primary glaucoma under the age of twenty. My patient was most probably attacked by the disease long before she came to consult me. I believe she had suffered for a considerable time from simple chronic glaucoma, and the more acute form she finally developed only appeared about the time immediately preceding or following her unfortunate marriage, when we may assume that congestive phenomena would be very likely to show themselves in the ocular regions.

Case III. presents no features of interest beyond the youth of the patient, aged thirty-five, and it is not impossible that the glaucoma may be secondary to the growth of an intraocular tumour. She would not come into hospital, and has been since lost sight of.

Case IV. is interesting from the youth of the patient, aged thirty, the hereditary nature of the disease, and the association of both venous and arterial visible pulsation. The arterial pulsation was not confined to the disc, but was visible in all the larger arteries to a considerable distance from the disc, thereby refuting what is stated in Græfe Sæmisch ("Handbook," vol. vi., p. 8), that the glaucomatous arterial pulse is only visible in the disc.

This case is also interesting from the support it lends to the views of Priestley Smith upon the ætiology of glaucoma. Mr. B.'s eyes were obviously microphthalmic, *i.e.*, they appeared microphthalmic to ordinary inspection, and the corneal diameter was in each of them below that of the average eye.

As is well known, Mr. Smith brought forward the statistics which have been quoted above in support of a theory that glaucoma depends to a certain extent upon the presence of a large crystalline lens, and a narrowing of the circumlental space. He has fully established two points: (1) that glaucoma is pre-eminently a disease of advanced life, and that to an extent not formerly realised by oculists, and (2) that the lens steadily increases in volume and diameter up to extreme old age, while it is known that the connective tissue structures surrounding it attain their full dimension early in adult life.

Mr. Smith regards a narrowing of the circumlental space as the underlying cause of glaucoma, and the determining conditions may be either an abnormally large lens, an abnormally small ciliary region, or an abnormal enlargement of the ciliary processes.

It is unlikely that an abnormally large lens was present in any of the cases here recorded. The age of the patients renders such a supposition improbable, and the only case which shows any evidence of an abnormally small ciliary region is Case IV. The only indication we have of the size of the ciliary region in the living eye is the diameter of the cornea. The average diameter of the cornea, as found in 1,000 eyes normal, except for refractive errors, is 11·6 mm. (*vide* Priestley Smith, *loc. cit.*). The diameter in Case IV. was only 11 mm. The diameter in all the others, except the doubtful Case III., was above the average.

The spontaneous occurrence of the low tension in Case IV. is a phenomenon for which I can advance no explanation. The state of the eye as regards shallow anterior chamber and dilated pupil was just the same as during the previous attacks of undoubted glaucoma. The future of this eye will be a matter of considerable interest, and I hope to have an opportunity of reporting upon it again.

Case V., too, offers matter for future investigation, both

as to the fate of the eye operated on (whether cataract may not form in it as the result of the blow during sleep), and as to the condition of the second eye, which has both high tension and keratitis punctata, and may develop either or both affections again. The occurrence of high tension as a sort of forerunner of keratitis punctata may have some bearing upon Smith's theory of a narrow circumlental space, and is a novelty in my experience.

A table is appended of the size of the corneal diameter in all the glaucoma cases where I have measured it. The number is not large, but the figures are given in the hope that other oculists of greater experience may be induced to let us know their observations upon this point.

No. of Eyes		Age		Eye	Corneal Diameter in mm.
1	Ellen S., D.C., 3,840, Oct. 1891	60	Acute Glaucoma	R.	12·5
2	Do.		Do.	L.	12·5
3	Bessie H., D C., 3,841, Oct. 1891	50	Acute Glaucoma	R.	12
4	Do.		Do.	L.	11·5
5	Michael C., D.C., 3,963, Oct. 1891	71	Chronic Glaucoma	R.	12
6	Do.		Do.	L.	12
7	Mary G., D.C., 2,715, Sept 1891	35	Acute Glaucoma	L.	11·5
8	Anne K., H C., 379, Oct. 1891	60	Acute Glaucoma	R.	11
9	Do.		Do.	L.	11
10	Pat L., H.C., 400, Oct 1891		Chronic Glaucoma	R.	12
11	Do.		Do.	L.	12·5
12	Pat C., H.C., 426, Nov. 1891	75	Chronic Glaucoma	R.	12·5
13	Mary S., H.C., 464, Dec. 1891	77	Chronic Glaucoma	R.	12·5
14	Do.		Do.	L.	12·5
15	Elizabeth K., D.C., 3,043, Nov. 1891	62	Chronic Glaucoma	R.	12·5
16	Do.		Do.	L.	12
17	Mrs. J., Sept. 1892 (A.H P.)	72	Chronic Glaucoma	R.	12
18	Mrs. D., Sept. 1892 (A.H.B.)	60	Acute Glaucoma	R.	11
19	Do.		Do.	L.	11
20	Mr. R., Case V.	34	Chronic Inflam. Glau. & Keratitis Punctata	R.	12·5
21	Do.			L.	12·5
22	Mrs. B., Dec. 1892.	50	Chronic Inflam. Glauc.	R.	11
23	Do.		Do.	L.	11
24	Mr. M., Nov. 1892	64	Chronic Glaucoma	R.	12
25	Do.		Do.	L.	13
26	Mr. B., Case IV.	30	Chronic Inflam. Glauc.	L.	11
27	Mrs. B., Mother of Case IV.	62	Chronic Inflam. Glauc.	L.	12
28	Mrs. H., Case II.	18	Chronic Inflam Glauc.	R.	12·5
29	Do.		Do.	L.	12·5
30	Nina, M., Case I.	13	Acute Glaucoma after Cocain	R.	12
31	Do.			L.	12

Thirty-one eyes affected by glaucoma were measured, and the average corneal diameter amounts to the figure of 11·9 mm., or 0·3 mm. above the average diameter as ascer-

tained by Priestley Smith. The largest diameter measured was 13 mm. and this only occurred once. The smallest was 11 mm. and this was found in eight eyes.

The President said Mr. Story's first case was of interest on account of the youth of the patient and also of the ætiology of the disease, which added another terror to the use of cocaïn. The same local effect may be induced by atropin, but not in such a striking way. The mechanism of mydriasis was not yet explained, inasmuch as it varied with different drugs, and also because the movements of the iris were not thoroughly understood. Any observation pointing to the exact effects of different drugs must be interesting in a practical way to oculists, and in a theoretical way to physiologists.

Mr. Swanzy said that the point which interested him most in Mr. Story's paper was that the measurements of the cornea in three of the cases were up to the normal average, which would seem to point to the eyes being of normal size and quite able to contain the lens, and to the unlikelihood of the perilental space being of small size. The explanation of these three cases was therefore difficult. The case was different with the others, in which the eyes were smaller than usual. He had seen a case of simple chronic glaucoma in a child of nine.

Mr. A. H. Benson said that it would be interesting to know if in those cases of high tension in young people the whole globe of the eye was enlarged. Did they begin as simple chronic glaucoma, or was there anything special in their condition? He remembered a case of glaucoma in a girl blind for many years, who had the appearance of enlargement of the primary type.

Mr. Story, in reply, said that the occurrence of glaucoma in a large eye was very curious. He had the measurements of thirty eyes in which glaucoma existed, and one of these was that of a young man, thirty-four years of age, who had chronic inflammatory glaucoma in both eyes, and yet his corneal diameter in each eye was 12½ mm. He had all the recognised symptoms except a shallow anterior chamber and a narrow corneal diameter. The young married woman had evidence of general dilatation of her eyes. They were myopic, and he attributed the myopia to the occurrence of the high tension. The bottoms of the cups were 8 and 5 degrees myopic respectively, and the margins 3 degrees in one and 4 degrees in the other eye.

A CASE OF SYRINGOMYELIA.

By J. B. COLEMAN, M.B., M.Ch.;
Physician to Jervis-street Hospital, Dublin;
And JOSEPH O'CARROLL, M.D., F.R.C.P.;
Physician to Richmond, Whitworth, and Hardwicke Hospitals, Dublin.

[Read in the Section of Medicine, December 16, 1892.]

BEFORE detailing the history and symptoms of the case which we bring before the Academy this evening it will be advisable to give a short account of the condition described under the term syringomyelia. When the primitive dorsal groove of the embryo closes in, so as to form a tube, the cells on the inside of this tube undergo multiplication and differentiation until finally they take shape as the spinal cord. Now, the early spinal cord is formed mainly of two lateral halves united by a commissure in front, and separated by a deep groove behind. After a further period the posterior or dorsal part of the cord grows to its due proportion, and in so doing the adjacent columns meet across the middle line, dividing the original great median fissure into an interior tube, the central canal, and the remnant of the fissure the posterior median fissure. The tissues which go to make up the cord at this early period are two, namely, nerve tissue and embryonic neuroglia; the former constituting the main bulk of the cord, the latter its connective skeleton. But the neuroglia in addition lines the fissure between the two halves of the cord, and when their union is complete it surrounds the central canal, lines the posterior fissure, and offsets of it are found in the immediate neighbourhood of the posterior root-bundles. Now, the development of the cord may stop at several stages short of completion. The central canal

may remain unduly large, but, nevertheless, regular in outline; or the junction of the dorsal portions of the cord may take place at any position between the normal one and the hindmost limit of the posterior fissure; or the dorsal expansion of the cord may take place unevenly so as to throw a portion of the original posterior fissure or an offset from it sideways into one or other posterior column. Finally, it is supposed that in some cases the cord may be duly developed so far as outside appearance goes, but may contain an undue amount of this embryonic neuroglia in which a hæmorrhage or a liquefactive degeneration may easily be determined by degrees of violence which would be insufficient to affect a normal cord. To the condition in which a distinct cavity persists in the cord, equally with that in which a cavity is formed *de novo* in this embryonic neuroglia, is applied the name *syringomyelia*. Leyden distinguishes cases of dilated central canal by the name *hydromyelia*, reserving the name *syringomyelia* for the eccentric, and, for the most part, unsymmetrical excavations, which have been found in cases diagnosed during life. One of us on a former occasion brought before the Academy a spinal cord in which the central canal was dilated symmetrically;[a] and we exhibit this evening a patient whose cord would probably afford an example of irregular excavation.

The clinical characters of syringomyelia seem to be determined, first, by the initial *defect* of such portions of the cord as may never have replaced the original indifferent neuroglia, and in the second place by the *pressure* of fluid filling up congenital or acquired spaces in this neuroglia, upon the grey or white matter in its neighbourhood. Inasmuch as the excavation in the great majority of cases

[a] A Case of Hydromyelus. By Joseph O'Carroll, M.D. Transactions of the Academy, 1891.

occupies the posterior half of the cord, disturbances of sensation are usually among the early and prominent symptoms; if the pressure bear laterally it may interfere with the crossed pyramidal tract and produce the phenomena of lateral sclerosis; in fact, a spastic condition of the lower limbs is very commonly met with; when the pressure or excavation reaches far forward in the grey matter we may have signs suggestive of progressive muscular atrophy. Inasmuch as the excavation usually occupies the cervical and upper dorsal portions of the cord it is in the areas of distribution of the nerves of these regions that the sensory, motor, and trophic disturbances are for the most part found. The spastic condition of the lower limbs probably results from descending degeneration in the pyramidal tracts. Ascending degenerations occur, but with less frequency. Thus, bulbar symptoms, or even mental degeneration, may supervene on the one hand, while on the other paralysis of the bladder and bed-sores may precede dissolution. The disease known as Morvan's, in which the prominent symptoms are painless whitlows and progressive anæsthesia, is believed to be but a form of syringomyelia. Lastly, it is to be noted that degenerative changes occur in the nerves of the areas involved, so that the condition may be for a time, at least, mistakable for neuritis.

The differential diagnosis of syringomyelia has to exclude tumour or hæmorrhage in the cord, pachymeningitis, and neuritis. The condition is too chronic and gradual for tumour or hæmorrhage, too painless for pachymeningitis. The anæsthesia and trophic lesions may resemble those found in leprosy, from which, however, the diagnosis ought to be easy, except in a leprous country. There is just one other condition which has to be taken into account, namely, a proliferation of an originally excessive

neuroglia under some stimulus or other—not a glioma, but a gliosis. Herein lies the greatest diagnostic difficulty, but the differentiation has no great clinical worth if we exclude the supposition of Kahler—no doubt, a great authority on this obscure subject—that cases of central glioma (not meaning thereby the ordinary gliomatous new-growth) are prone to run a less chronic course than those of syringomyelia.

The patient shown this evening has been under our observation for some months. He is thirty-six years old, is highly intelligent, and has a keen memory of all the details of his illness. His family history is good; he has never had syphilis, and was always of sober habits. He says that as a child he was clumsy in his movements, and we have accidently met a gentleman who knew him about fourteen years ago, who informs us that at that time, long before any manifestation of his present condition, he was awkward in his gait. In January, 1880, when running across a field his right foot caught in a hole, and his body got a twist; he felt something give way in his right side, and "the sight left his eyes" for a moment. He took no further notice of this, till the following November, when, having in the meantime gone to America, he began to suffer from a pain in the right lower costal area. He is still tender to pressure in this region, and now and again he has momentary pain in the areas of distribution of the right lower intercostal nerves. From December, 1881, to March, 1888, he was a clerk in a railway clearing-house in London. In March, 1886, he noticed a swelling of the right hand, which went away after a week's rest. In March, 1888, this swelling appeared again, and with it some anæsthesia, for the pen or walking-stick used to drop from his hand unless he kept his eyes on it. He says that in June he saw Dr. Beevor, who told him that he had loss

of fine feeling in the right hand. In March, 1889, being absolutely incapable of earning his bread as a clerk, he went again to America, and got work as a street labourer in Philadelphia. He was discharged from this work as incapable after a few weeks; but he managed with one employment and another to get over the time till April, 1890, when he sold newspapers for a while, then became a watchman for a cable car company, then sold papers again, and finally broke down last winter (1891–2) with a prolonged attack of diarrhœa. He says that in November last year Dr. Da Costa lectured on him as a case of progressive muscular atrophy, and that he subsequently saw Dr. Weir Mitchell, who said to him: "You may have progressive muscular atrophy, my man, but you have something more than that." We mention these respected names, trusting in the substantial accuracy of the man's story, as a help in realising the progress of the case. It is to be remembered that at the time Dr. Da Costa saw the patient he was emaciated in consequence of chronic diarrhœa. He came to Ireland in April of this year, and has since then been in Jervis-street and the Whitworth Hospitals. During this period his condition has hardly changed in any way, except that he has gained in weight. His condition at present is as follows:—Right leg: spastic in movement, knee jerk increased, ankle clonus, rectus clonus, somewhat ataxic in fine movements. Left leg: knee jerk slightly increased (?); a trace, perhaps, of ankle clonus, not spastic. In both lower limbs from toes to crest of ilium sensation is perfect. No bladder or rectum troubles. Upper limbs: the right hand and wrist are purple, swollen, with a "solid œdema," cold; skin smooth, glossy, and thin on the back; smooth, glossy, and thickened on the palm so as to resemble scleroderma. The palm is concave, due apparently to contraction of the

PLATE I.

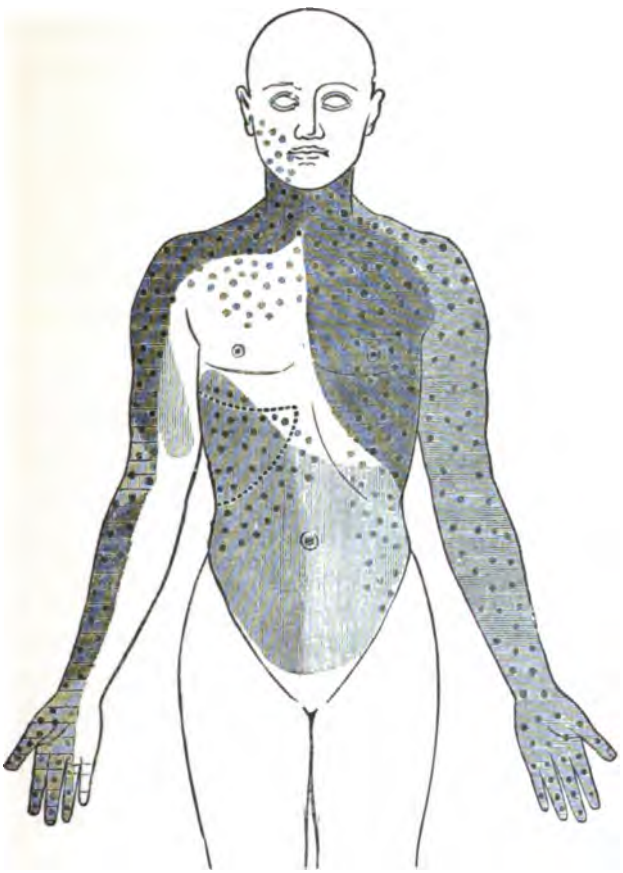

Diagram to illustrate sensory defects in case of syringomyelia. Front view:—Vertical shading shows according to its heaviness increasing degrees of simple anæsthesia. Horizontal shading, varying degrees of analgesia (exceedingly slight in right arm). Dots show degrees of thermic insensibility. Right inferior costal area of hyperæsthesia bounded thus: - - - - - - -

PLATE II.

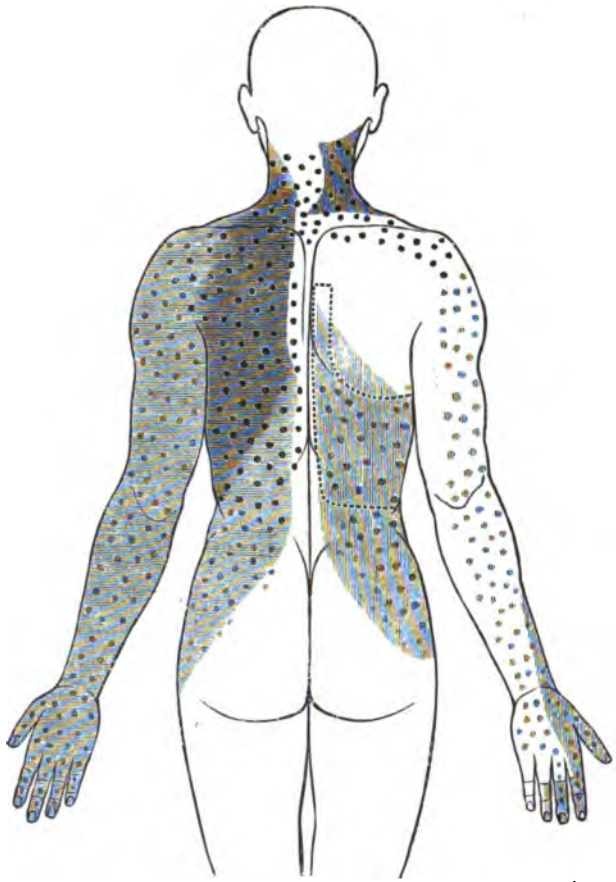

Diagram to illustrate sensory defects in case of syringomyelia. Back view:—Vertical shading shows according to its heaviness increasing degrees of simple anæsthesia. Horizontal shading, varying degrees of analgesia (exceedingly slight in right arm). Dots show degrees of thermic insensibility. Right inferior costal area of hyperæsthesia bounded thus: - - - - - - -

skin by which the thumb is abducted, and the fingers more and more flexed from index to little finger. The power of grasping is very imperfect. When he uncloses the fingers they sometimes go into clonus, and this can readily be evoked by a slight extension applied to the bent terminal phalanges. The left hand approaches in shape to the *main en griffe;* its colour is usually an ashy red, never so distinctly bluish looking as the right. It is cold also, not swollen like the right, but a patch of solid œdema may be recognised on the back. The skin is normal in texture, the fine lines not erased nor softened down. Its power is better than that of the right, whether for grasping or for buttoning his coat; but it is, nevertheless, poor. The right arm is very weak throughout, and its movements limited. He can bring his hand to the forehead fairly easily, to the right ear with difficulty, to the back of the head not at all. The highest point of the back which he can touch, starting from below, is the lowest lumbar spine. The upper portion of the right trapezius is completely atrophied, the deltoid partially so. The left arm is quite subnormal in power, but is nevertheless stronger than the right, although its girth is less than that of the right (3 inches below elbow, 23 cm. as against 25·5 cm., or one inch less). He can touch the poll with the left hand, and starting from below can touch the last dorsal spine.

As a result of the atrophy in the upper part of the right trapezius the shoulder drops. The interrupted current evokes contractions in all the chief muscles of hands and arms, except the clavicular portion of the trapezius; but the current required is greater than would be necessary for healthy muscles. This is especially the case with both deltoids. There is therefore, in all probability, with the exception of the upper portion of the trapezius, no complete muscular atrophy. It is especially to be noted that

contraction is prompt and fairly good in the muscles of the clumsy right hand.

The pupils are normal; sight is good; the face is not quite symmetrical, the naso-labial fold being better marked on the left side than on the right.

The way is now clear for the discussion of the prime peculiarities of the case—the disorders of sensation. These lend themselves so well to diagrammatic demonstration that, important and widespread as they are, they will not detain us long. The diagrams are shaded lighter or deeper according to the slightness or greatness of defect. They do not pretend to absolute accuracy of demarcation or of graduation; for instance, it is possible that in some areas which are left unshaded sensibility may not be quite perfect, but the fact remains that for all practical purposes they are normal, while the shaded parts are abnormal.

Simple anæsthesia (insensibility to touch) affects in varying degrees the right half of the neck, the shoulder, outer and anterior half of arm, forearm, and outer part of palm and dorsum of hand; the right side of the trunk, with the exception of the scapulo-mammary area; and to a slight degree the left half of the front of the abdomen. Slight pressure over the right lower ribs causes pain, but there is no cutaneous hyperæsthesia.

Analgesia (insensibility to pain), as tested by pricking, scratching, and pinching, is present mainly on the left side, in the neck, arm, forearm, the thoracic area in front and the thoracic and lumbar areas behind. In these regions a prod of a thick compass point is recognised as different from the prick of a needle by being heavier—a severe pinch is felt as heavier than a gentle one. In some portions of this analgesic area, especially the infra-clavicular region, and the upper arm, such perception of hurtful stimuli as occurs, separate from that of weight, is of a twitching in

the left jaw below the angle of the mouth, possibly due to some contraction of the platysma. In the area of tactile anæsthesia on the right side sensibility to pain is not quite so acute as in the adjacent non-anæsthetic regions.

Sensation of temperature-changes is deficient over a very wide area, corresponding nearly to the combined areas of anæsthesia and analgesia. It is noticeable, however, that it exceeds them in involving a portion of the right cheek. About the right clavicular area there seems to be a reversal of sensations; the hot test-tube is mistaken for the cold one, and the cold one for the hot. During the late cold weather he had no feeling of cold in the upper limbs except at the inner border of the right hand. Electro-cutaneous sensibility is absent or deficient in the combined areas of anæsthesia and analgesia.

The sense of limb-position is good in the left arm; quite absent in the right.

Mr. Swanzy kindly examined the patient's eyes, and found them to be in all respects functionally and organically healthy. The fields of vision were normal, as also the acuteness of vision and the ophthalmoscopic appearances.

The conditions presented in this case may be summed up as follows:—Distinct atrophy of the claviculo-occipital portion of the right trapezius muscle; diffused trophic changes in most of the structures of the right upper limb, and to a less degree in those of the left; spastic phenomena in the right leg; loss of tactile sensibility in a considerable portion of the right arm and hand and the right side of trunk; loss of pain sensibility in the left arm and hand and a considerable area of left side of trunk; loss of muscular sense in the right arm; and of temperature sense in both upper limbs and over most of the trunk. This "dissociation" of sensory defects is one of the most suggestive phenomena occurring in syringomyelia. Lastly,

there is tenderness on pressure in right inferior costal area.

The regional physiology of the spinal cord is as yet too backward to permit of any reliable localisation of the lesion which exists here. We can say that the mischief ends above, short of the medulla, and below, probably short of the lumbar region, except for such degeneration as may exist below in the lateral pyramidal tract. But with regard to the transverse distribution we can be certain of little more than that it varies somewhat at different levels, and that, as the sensory phenomena are so prominent, it follows the rule in impinging mostly on the posterior columns and the posterior commissure. It can hardly have involved the spinal origin of the spinal accessory, for the right sterno-mastoid muscle is in good condition, so that the partial atrophy of the trapezius is probably due to involvement of the nuclei of the cervical nerves which join the spinal accessory in supplying that muscle.

As to the course of the lesion, it may be surmised that the first marked involvement of the cord took place at the level at which the median nerve-bundles take origin, for it was in the terminal distribution of the right median that the earliest anæsthesia was noticed. This, however, does not exclude the possibility that the determining cause of the excavation was lower down, and one cannot help asking whether the strain suffered in 1880 in the area in which pain is still felt, supplied the morbid stimulus. Cases are on record in which occlusion of the central canal below seems to have determined dilatation of the canal above. It would seem improbable that an injury of the bones or ligaments of the spine suffered in 1880 should produce its evil fruit in 1886, were it not that there is a continuous history of localised pain during the

interval; and in any case we have to explain the fact that the right leg is so markedly spastic as compared with the left. The subsequent development of syringomyelia would be predisposed to by a congenital tissue defect which seems to be hinted at in the history of clumsy gait.

The President said he hoped that the authors of the paper would acquire possession of the spinal cord of the case described. We do not know whether the term syringomyelia covers one pathological condition only. Since the condition is liable to occupy different regions and to involve different portions of grey and white matter, an exact clinical portraiture was not to be had. Dr. Ormerod had described a case similar to Dr. O'Carroll's, except that his case had also curvature of the spine. The two main points relied on by him, as well as by Dr. O'Carroll, were extreme muscular atrophy and interference with thermal sensations.

NOTE ON A CASE OF PIN-SWALLOWING.

By JOHN KNOTT, M.A., M.D. Dub., M.R.I.A.

[Read in the Section of Medicine, December 16, 1892.]

The pin, which I have the honour to exhibit to the Medical Section of the Royal Academy of Medicine in Ireland, was swallowed by a child of a little over three years old. The accident occurred about 6 a.m. on Oct. 16th last. The child, a bright and beautiful little girl, had been in the habit of exacting from her mother the duty of supplying her with morning tea at this early hour. She had also been affected with some bronchitis for a couple of days before, and her neck had been wrapped up with warm flannel for the night, which was secured in position by the pin in question. Having arranged the preparation of early morning tea, the mother returned to the room to find the flannel loosed from its place around her child's neck, and the pin gone. The child showed some slight choking symptoms, and her mother hurriedly gave her some tea to drink, when they disappeared.

The pin was swallowed on Sunday morning. I was out of town on that day and the following, and met the father of the child on Tuesday, who is a gentleman engaged in business in the city, and an old friend of mine. He took me at once to his residence to see his little girl, about whom both parents were naturally very anxious. I found that the child was coughing a great deal, and had been suffering from what her mother called "croupy" symptoms during the course of the few nights previous. She had accordingly received some hippo wine, and also got some aperient medicine. She had some diarrhœa on the day of my visit. There were no symptoms that could be referred to the presence of the pin

in the alimentary canal. The parents were, of course, terribly anxious about their little one, and naturally wished to know whether anything could be done to remove the dangerous foreign body. I tried, as well as I could, to calm their apprehensions, but could not give them any encouragement in the way of active interference. I told them that I could not conscientiously recommend the operation of laparotomy, or even of trephining, which are the principal surgical procedures adopted for the removal of offending substances from the great cavities of the human body.

My interest in the case was intensified by the fact that a case of pin-swallowing—occurring in a child of fourteen months old—was one of those for which I had to give advice on the first day on which I did resident surgeon's duty at the Richmond Hospital. But a short time before that occasion I had been reading Sir Thomas Watson's excellent advice for treatment of cases of swallowing foreign bodies, in which this brilliant lecturer did not hesitate to impress upon his pupils that average medical practice may, upon occasion, be sensibly improved even by the adoption of a hint offered by the traditional custom of a London pickpocket. I adopted his suggestions, and directed the anxious mother to feed her child for some time to come on the driest food it could well be got to swallow—dry, stiff, oatmeal porridge, hard-boiled eggs well rubbed up, and so on—and to let the bowels take care of themselves during the treatment. She went off apparently little satisfied with the very homely directions which she had received. She told me that she had heard that some doctors could give medicine that would "melt" the pin in her child's body. I assured her that such medicine, which was said by some to have been successfully employed in the days of the older alchymists, was entirely unknown to the profession in the present day, and dissuaded her as strongly as I could from the use of medicine by the

mouth in any shape or form. Although but little reassured, she promised to follow my advice; and, on the eighth day from that date, she brought the missing pin to the hospital for my inspection. It had passed by the bowel that morning; it was very crooked, and had been embedded in a mass of hardened fæces. The intense gratitude with which she presented it to me forms one of the most vivid recollections of my professional experience, and certainly formed a striking contrast to the very limited degree of respect with which she had treated my advice on the day on which she consulted me.

A few years ago, a lady brought her child, an exceptionally bright and active girl, of a little less than two years old, to consult me about the nature and treatment of a lump which she had discovered on the inner side of the left thigh, when dressing the little one on the morning of her visit. I found a longitudinal tumour, nearly three inches in length, the lower end of which was a little below the middle of the thigh, while its long axis was pretty accurately parallel with that of the femur. Lateral pressure did not seem to cause any pain, but pressure applied to the ends caused the child to wince, while there was no apparent alteration of the skin. The tumour, whatever it was, seemed to possess a shape regularily cylindrical, even to a degree of mathematical accuracy. I was a good deal puzzled as to its nature, for I knew of no neoplasm which would be likely to develop with so regular physical outlines. While trying to think out an opinion on the case, I continued to manipulate the mysterious lump, and suddenly noticed that on pressing at the upper end it moved a little downwards from its place. This effect naturally induced me to continue the pressure, and the movement continued, more and more easily as it passed downwards, while the lower end of the tumour became obviously pointed. Observing the latter change, I pressed

the tissues firmly outwards against the inside of the femur, and drew the tumour downwards, so as to press against the skin so made tense. To my great surprise, the point of a needle suddenly emerged from the skin, after which, of course, a very little traction was necessary to extricate the rest of the domestic implement, which measured a little over two and a quarter inches in length. The anxious mother, who was present, screamed with intensity of emotion on seeing the needle brought to light; and at once recollected that about nine months before, when she had been playing with the child after sewing, and had been treating her baby, with maternal fondness, to some play with her thimbles, reels of cotton, &c., the child had put a needle into her mouth. Something had, at that moment, turned the mother's attention to another corner of the nursery, and, when she again directed her looks to the baby in arms, the latter was evidently swallowing something, while the needle had disappeared. The child coughed spasmodically for a little, then commenced to cry, but almost immediately stopped. The mother was at first greatly frightened and very anxious, but as no other symptoms appeared, either then or at any subsequent date, she hoped that the needle had merely dropped out of sight somewhere, in the mysterious way in which needles so often do, and had not been swallowed at all. So long an interval of time had elapsed, that she had entirely forgotten all about the incident till she saw the needle extracted from her child's thigh. The point was somewhat blunted, and the whole body of the needle slightly eroded on the surface by its prolonged incarceration in the tissues and fluids of the child's body. The erosion was, however, but very superficial, and it was otherwise thoroughly preserved.

The pin which I have exhibited on the present occasion had been swallowed more than two days before I saw the

child. The little one, after the first minute or two, had displayed no symptoms that could be referred to its presence in the body. She was then suffering from cough and diarrhœa, and had been receiving the domestic remedy of hippo. I had explained to the mother that, under the existing conditions, the hippo, cough, and diarrhœa were all very bad, as the first might produce sickness of stomach, which like the cough and diarrhœa, would have a decided tendency, by producing spasmodic contractions of the abdominal muscles, to press the pin through the wall of the digestive tube into some external cavity, organ, or vessel, where it might produce irreparable or even fatal mischief. I prescribed a mixture, the chief ingredients of which were liq. morph. hydrochlor., and potas. bromid., which had by the following day effectually checked both the cough and the diarrhœa. I impressed upon the child's mother that the great object of the treatment must be to keep the bowels confined, and to check all abdominal movements as far as possible, so that nature might have a fair chance of conveying the pin along the alimentary canal. I directed her to keep the child as quiet as possible, and mostly in the horizontal position; that all pressure upon the abdominal region should be most carefully avoided, and even, to a less extent on the chest wall; and, that when the child had to be raised, it should always be taken up by the arms. When it moved about, it was to do so quietly; and all rough play, especially such as involved sudden stooping, was strictly forbidden. I told the mother that no attempt whatever should be made to produce any movement of the bowels for a week at least, and that if she suffered from any colicky or wandering pains, the whole abdomen should be at once covered by a hot linseed poultice, which would give relief, and I would see afterwards what else could be done. The idea of keeping the child's bowels so long confined did not at all seem to reassure the anxious parents, but after the

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expenditure of a great deal of argument, I think I succeeded in persuading them that it was the best thing that could be done under the circumstances—in fact, the least of all impending evils.

This treatment was continued for a week, the dry food regularly continued, and the least possible quantity of fluids administered. The bowels during that period moved twice: the first motion was a small quantity of hardened fæces; the second, a large evacuation, and, as might be expected, extremely offensive. No pin, however, appeared.

I then directed that the treatment should be persisted in for another week, and told the child's parents that if the missing pin did not appear by the end of that period, this uncomfortable *regime* should be discontinued, and the ordinary mode of living again resumed. The bowels would clear out by enemas, and further developments awaited. The mother was greatly depressed by the idea of having her little one living such a life for another week, eating unenjoyable food, and suffering from the general heaviness and constant thirst, which necessarily accompanied the conditions. I comforted her as well as I could, and the treatment was carried out. The bowels were twice moved during the course of the week: masses of hardened scybalæ, of course, passed, and some of them were a good deal blood-stained, which did not tend to reassure the parents. At length, on the auspicious date of Halloween, about 9 p.m.—and, accordingly, about 9 hours less than 16 days from the time that it was swallowed, the offending pin appeared. It had passed with a large quantity of hardened fæces, in which it, however, as far as I could learn, had appeared to be but partially imbedded. Observation as to this point, may, however, have been deceptive, as I had instructed the mother to get the child to sit on a clean vessel containing at least a pint of clear water, so that the pin could be more readily found. There was no blood passed

with this motion, and the child did not specially complain of pain.

The pin presents a certain amount of erosion on the surface so as to give it an aged appearance, although I have been assured by the mother of the child that it was perfectly bright and new when swallowed. The advent of the pin made a happy Halloween in that household, and I have seldom heard so much gratitude expressed as I did on the 1st of November, when I visited there.

The case is, of course, one of the minor class, which, while fully qualified to produce great mental agony in private life, does not, nevertheless, figure with much dignity in the pages of a professional periodical or a scientific volume. I am fully sensible of this feature, and feel that I owe an apology to the Fellows and Members of the Medical Section for bringing this small communication under their notice. It must, however, be noted that such cases, trivial as they may appear when the result is fortunate, may attain a formidable degree of importance when fate has been less auspicious. Of twenty cases of the swallowing of pointed foreign bodies, which have been collected by Bernheim, and which had become entangled in the walls of the œsophagus, and produced fatal results by ulceration, no less than fifteen had opened into some one of the great vessels in the neighbourhood, and so caused death by hæmorrhage. Of these no less than seven had penetrated the aorta, an accident which is easily explained by the close proximity of this great vessel to the gullet during a great part of the course of the latter. Of the others, the greater number had passed through the coats of the left common carotid artery, a fact which can also be readily understood by the close anatomical relation established by the deviation of the œsophagus towards the left side, in the lower part of its cervical course. The others had pierced the right subclavian artery. A fatal case of perforation of the inferior

thyroid artery at the level of the cricoid cartilage has been recorded by M. Pilate. A fatal case has been recorded by Mr. Andrew (*Lancet*, 1860) of a woman who had swallowed a fish-bone, which penetrated the œsophagus and pericardium, and lodged in the interventricular septum of the heart, piercing the right coronary vein. The pericardium was found filled with blood, which had, of course, mechanically arrested the action of the heart.

Of the number of fatal accidents on record produced by the implication of other organs and cavities after the offending body had reached the stomach or intestine, there is practically no end, and I do not propose to attempt to tabulate them. Of those which have not immediately developed any serious lesions, some, by the mere irritation of their presence, have ultimately led to the same fatal result. Godelias and Mondiere have each recorded a case of cancerous stricture of the œsophagus attributable to the swallowing of a pin a long time before. In each case the pin was found embedded in the cancerous mass.

If we confine our attention to the swallowing of pins and needles only, it will be found, as indeed might be easily anticipated, that the great majority of recorded cases have occurred in the persons of females, children, and lunatics. Philosophic observers have declared before now that a special Providence appears to guard the members of at least two of these groups from the effects of accidents which might be deadly to less favoured specimens of the human family. All of the three cases to which I have referred in the present communication have occurred in female children—in each case exceptionally bright and intelligent members of their respective classes. As the result has also been in each case a gratifying one, I have thought, although with a considerable amount of diffidence, that the communication might possess some small interest for the Fellows and of Members the Royal Academy of Medicine in Ireland.

The PRESIDENT said that cases of supposed pin-swallowing were not to be treated with contempt, but that the precautions laid down as to diet should be adopted. Some years ago a child was brought to him who was stated to have swallowed a pin. He found the pin in the child's mouth, the head in one tonsil and the point in the opposite. Three years ago a lady came to him complaining of pain in her throat. She said she had swallowed a large piece of chicken. He drew up from her pharynx by means of a catheter a piece of bone.

DR. J. W. MOORE said that he had treated a case of a blind woman who swallowed a jagged piece of a mutton bone which had got into her soup. She vomited it after some retching and coughing. He had a similar case of a county court judge who swallowed a piece of a chicken bone. Neither the jagged mutton bone nor the sharp chicken bone seemed to have inflicted any serious injury on the soft parts.

DR. PARSONS mentioned a case which occurred in Sir P. Dun's Hospital of a girl who swallowed a plate for holding false teeth. She was treated in the usual way, and in five or six days the plate was passed *per rectum*. She had no further symptoms. The plate had two very sharp hooks on it, and it is strange how it traversed the intestines without causing injury.

DR. POTTER mentioned some cases of foreign bodies being swallowed. One was of a shawl pin. It lodged in the trachea and was extracted, except the head, which fell off and into one of the bronchi. It would be frequently coughed up into the trachea, but no further. The patient—a girl—left hospital, and her general health failed and she returned to hospital. An opening was made in the trachea and the head of the pin was coughed out of it. The girl completely regained her strength. He also saw a case of a pin removed from the neck; of a piece of bone removed from the pharynx per orem; and of a coin passed per rectum—all of which had been swallowed.

DR. BURGESS mentioned a case he saw of prolapse of the rectum, and in the prolapsed part he found a pin embedded. He had another case of a coin in the rectum, causing intense pain and drawing up of the anus. He removed it with his finger.

DR. DAWSON recently saw a case in which about 8 oz. of hardware were removed from a lunatic's stomach. During life there had been no symptoms caused by their presence.

DR. KNOTT briefly replied.

SOME RECENT CLINICAL EXPERIENCES.

By JOHN WILLIAM MOORE, B.A., M.D., M.Ch., Univ. Dubl.;
Censor and Vice-President, R.C.P.;
Physician to the Meath Hospital.

[Read in the Section of Medicine, January 27, 1893.]

During a recent period of clinical duty at the Meath Hospital, lasting from October 1 to December 31, 1892, an unusual number of interesting cases came under observation. It occurred to me that a selection from these would be acceptable to the Royal Academy of Medicine in Ireland, because, while they are no doubt types of the every-day clinical experiences of a hospital physician, the cases throw more or less light upon obscure features in diagnosis and pathology, and illustrate some practical points in treatment. The cases are as follow:—

1. Axillary Abscess in an Infant, simulating Scarlatina.
2. Septic Peritonitis from Rupture of a small Ovarian Abscess.
3. Retro-pharyngeal Abscess in a Man aged 45 years.
4. A Case illustrating the short Incubation and Invasion of Scarlatina.
5. Thoracic Aneurysm perforating the Pericardium.

Case I.—*Supposed Scarlatina.* (Reported by the probationer on duty in the epidemic wards, Miss Frances E. Robb).—The patient, J. D., a tiny baby of a fortnight old, was admitted to the observation ward of the Meath Hospital on the evening of November 11, 1892, supposed to be suffering from scarlatina. He was discharged perfectly well on November 25th. His mother is a fragile-looking young woman of twenty-four years, and her only other child pined away and died when three months old from no apparent disease of any kind.

The previous history of the case is slight, but the mother had heard of no cases of scarlatina in the neighbourhood, and cannot understand how the baby is supposed to have taken it, or where. Two days ago the patient appeared restless and very fretful, crying at night and during the day as though in pain. Appetite continuing as usual, and there being no symptoms of vomiting, purging, soreness of mouth or throat, his mother thought the illness would not signify, being probably only a slight cold. On the morning of the 11th, however, he seemed worse, and in the afternoon was seized with an attack of convulsions. A warm bath was given, and the doctor was at once sent for. The mother gave the infant a dose of castor oil, and on taking him out of the bath wrapped him in blankets and kept him near the fire.

When the doctor arrived he found the baby looking exactly like a big boiled lobster, and covered from head to foot with a tiny red rash, temperature high, pulse and respirations rapid, skin dry and feverish, and tongue dirty. With these apparent symptoms before him, the doctor seems to have had no hesitation in pronouncing the case to be one of scarlatina, and ordered the infant to be taken at once to hospital. Joseph was straightway carried off to the Meath Hospital, wrapped up in blankets, his mother not even waiting to dress him. On arriving at the hospital he was seen by the House Surgeon, who also thought the case was one of scarlatina, and ordered both mother and child to be admitted to the observation ward.

Nov. 11th.—On examination the patient was found to be very feverish, the skin dry and red, a diffuse rash all over the body. The right shoulder almost touches his ear; all around the shoulder, and extending down the side and chest, is a large tense swelling, evidently very painful, the infant screaming when it is touched. He appears to have little or no power in the right hand and arm, and the fingers do not close around anything placed in the hand as babies' fingers are wont to do. His mother noticed this swelling only the day before, but she cannot account for it in any way. She thinks it must be the result of a fall or a bruise, and yet she feels certain that no accident ever happened to the baby.

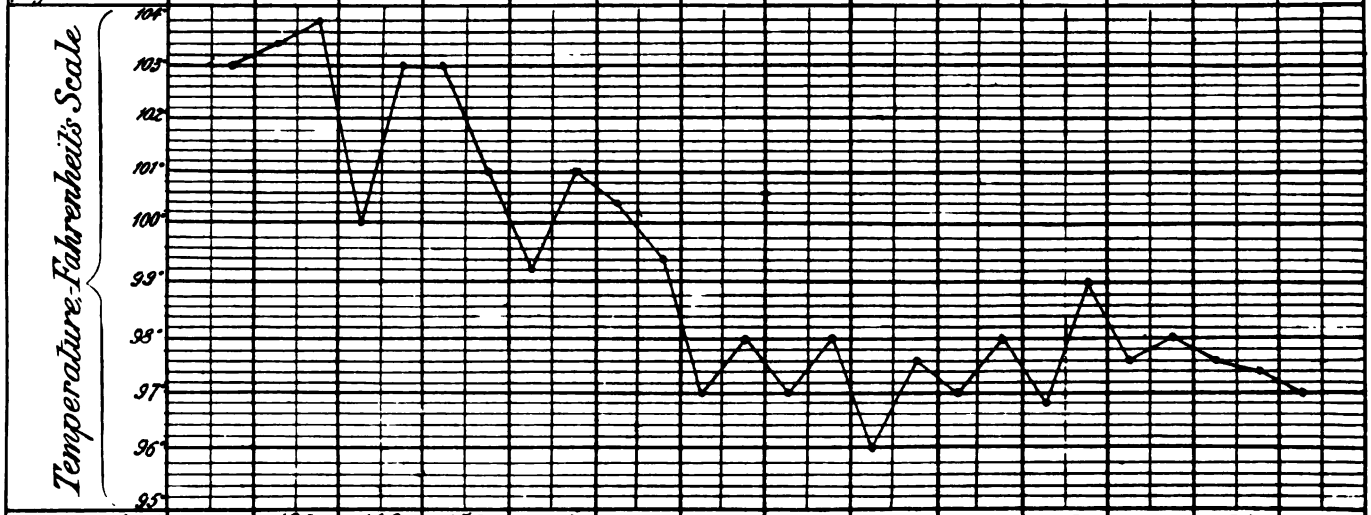
On the morning of the 12th the patient was examined by Dr. Moore, who pronounced him to be suffering from an abscess in the right axilla. There are no symptoms of scarlet fever except the redness, a rash, and feverishness. The redness and rash were undoubtedly partly due to the feverishness, but also to the hot bath

Chart No. I

CLINICAL CHART OF TEMPERATURE

Name, Joseph Doran, Age, 2, Weeks, *Result, Recovery*

Date	NOV. 1892. 11	12	13	14	15	16	17	18	19	20	21	22	23	24
Day of Disease	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Pulse. M		130	140	150	125	120	120	125	130	110	112	120	120	120
Pulse. E	160	130	160	160	120	120	100	130	140	130	120	120	124	
Resp M		48	60	50	48	40	40	36	40	32	32	36	36	34
Resp E	70	48	60	56	36	48	48	40	44	36	34	40	38	
Motions	0	1	1	3	1	1	0	2	1	1	2	2	2	



and the wrapping in blankets. The feverishness was a secondary fever, arising from the presence of the abscess. The infant's age is against the diagnosis of scarlatina; he has had neither vomiting nor purging, nor sore throat, nor sore mouth, nor swollen glands; he has not been exposed to infection so far as can be made out. It was ordered that the swelling should be carefully smeared with vaseline and poulticed with linseed meal thrice daily, the infant to be kept warm and carefully watched.

November 15th.—The abscess has been poulticed since the 12th instant, and this morning it broke, a considerable quantity of unhealthy pus coming away. The rash has quite disappeared. Dr. Moore, on examining the patient to-day, ordered the linseed meal poultices to be stopped, and boric acid dressing to be used instead once a day. There was an unpleasant odour from the discharge.

17th.—Swelling has almost all gone; there is still some discharge; infant looks much better.

20th.—The boric acid dressing has been stopped to-day, as all discharge has ceased; dry dressing to be used instead.

25th.—Patient left to-day quite cured, and looking healthy and strong. The wound is completely healed.

Remarks.—Even before I saw the patient, I questioned the correctness of the diagnosis of scarlatina, remembering how singularly immune against this infectious fever most nurslings are. Many years ago I was asked by Dr. Richard Purefoy to take charge of a lady, one of his patients, who had unfortunately developed an attack of scarlatina while nursing her baby.

The question at once arose whether mother and child were to be separated. On ascertaining that the mother had an abundant supply of milk, I unhesitatingly advised that she should continue to nurse her infant, on the ground that she would be relieved from all trouble with her breasts, and from the excitement attending separation, while the infant would run little or no risk. Throughout that lady's illness she continued to nurse, and the child took no harm.

Several years afterwards I pursued a similar course under

analogous circumstances, and with equally good results. So slight is the susceptibility of infants under six months to scarlatina, that a diagnosis of the disease in so young a child should be received with caution, if not with scepticism.

In the case now recorded, the infant had no difficulty in swallowing, and there was no evidence that the throat was sore. The child sucked as well as ever, and the cervical glands were not enlarged. Although the pulse was 160 at the time of admission, the normal rate of the pulse in an infant aged two weeks—120 to 140—is to be borne in mind—in a word, the pulse was not quick enough for scarlatina. The rash and injection of the skin could be accounted for by a fever in so young a child, as well as by the administration of a warm bath. To crown all, the discovery of an axillary abscess sufficiently explained the pyrexia and the other constitutional symptoms in the case.

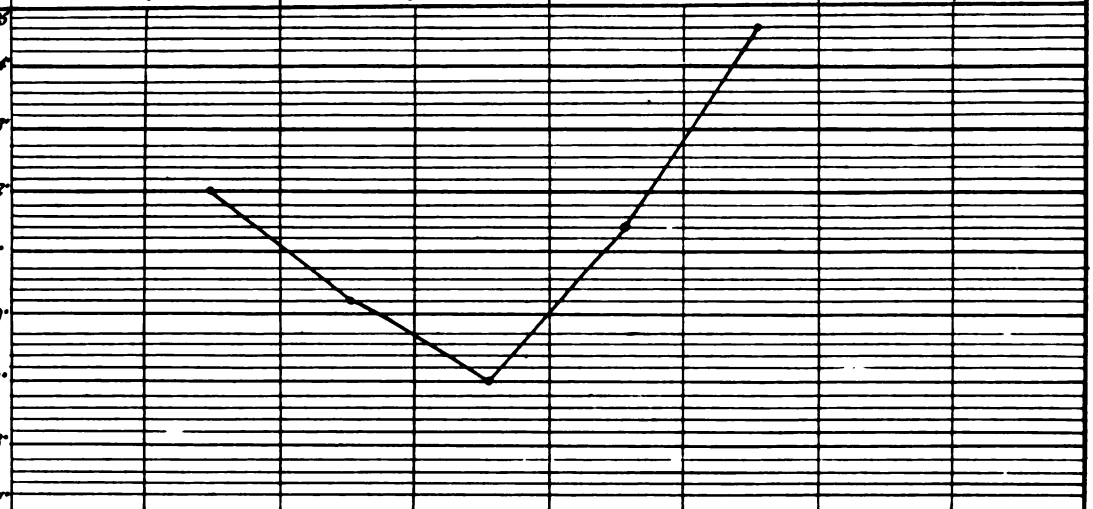
Case II.—*Septic Peritonitis from Rupture of the Right Ovary.*—My Clinical Clerk, Mr. George Peirce Moore, furnished me with the following notes of this case:—Mrs. M., aged thirty-three, was admitted into the Meath Hospital on Monday, October 31st, 1892. On admission the patient gave the following account of her illness:—She had been in her usual good health up to the previous Friday, when early in the day she was seized with a violent pain in the "stomach;" shortly afterwards diarrhœa and vomiting set in, the former being very severe. Finding herself worse on Sunday, she came to the hospital on Monday afternoon. She then was in pain (not very severe), had much dyspnœa, a pulse of 140, her temperature was 102° F., and diarrhœa was severe, 8 motions occurring in the course of the evening. The motions were not characteristic of enterica.

On Tuesday the abdominal pain was more intense; there was much tympanites; pulse, 130; respirations=48; temperature had come down to 100·2° F. The patient now commenced to menstruate. She was put on opium (1 gr. every third hour), an ice poultice was applied to the abdomen, and mustard cloths were wrapped round the legs; brandy, 4 oz. When seen the same evening she appeared in much less pain, spoke hopefully of herself,

Chart No. 2

CLINICAL CHART OF TEMPERATURE.

Name, Mrs. M. M. Age, 33, Disease, Peritonitis, Result, Death.

Date.	Oct. 31. 1892	Nov. 1.	2	3
Day of Disease	4	5	6	7
Temperature. Fahrenheit's Scale. (105° 104° 103° 102° 101° 100° 99° 98° 97°)				
Pulse M	1	130	124	
Pulse E	140	120		
Resp. M		48	60	
Resp. E	44	52		
Motions	10	4		

and said she was much better. She took some milk and brandy during the evening and night.

On Wednesday the patient looked worse; her face was cyanosed; respirations, 60 per minute; pulse, 124; she had become unconscious, and there was suppression of urine; her pupils were widely dilated; the abdomen was tense and full. The patient gradually sank (temperature at 7 p.m.=104·8°), dying at 8 30 p.m.—*i.e.*, on the sixth day of her illness.

On *post-mortem* examination the body was found to be well nourished. On opening the abdomen a large amount of greenish, purulent, and lymphy exudation escaped; there was much matting together of the intestines to each other, and to the abdominal parietes, and all the pathological appearances of general peritonitis were present. No intestinal lesions proper could be found; the mucous coat of the ileum looked healthy, and there was not the slightest enlargement of either the agminate or the solitary glands. The lungs, heart, liver, and kidneys all seemed healthy. Eventually the ovaries were found to be much congested; the right ovary being three times its normal size. On gently lifting it a linear rupture was found on its posterior surface, with effusion of clotted blood, pus, and debris around it; there was no pyosalpinx. Death was thus proved to be due to peritonitis, caused by inflammation and rupture of an ovary, occurring probably at the menstrual period.

Remarks.—When I first saw Mrs. M. it occurred to me that perhaps she had really been suffering from latent enteric fever, and that perforation had unexpectedly taken place, giving rise to general peritonitis. From this grave malady it was only too evident she had been suffering from the Friday before her admission—that is, for four days inclusive. As this was so, any operative measures seemed to be out of the question, more particularly as her strength had ebbed fast. The question of the ætiology of the peritonitis was set at rest by the *post-mortem* examination. Not a trace of disease was forthcoming in the ileum, the ileo-cæcal valve, the vermiform appendix, or the cæcum and colon. On the other hand, the inflamed and ruptured state of the right ovary, which had evidently been the seat of a purulent

oöphoritis, afforded a ready solution of the question "Whence sprang the fatal peritonitis?"

Case III.—*Retro-pharyngeal Abscess.* (Notes by Mr. George P. Moore, Clinical Clerk, and Miss Frances E. Robb, Probationer).—John K., a labourer in a large brewery, aged forty-five, married; admitted on Sunday afternoon, Nov. 13th, 1892, into the observation ward of the Meath Hospital. The patient, a stout, strong, powerfully-built man of intemperate habits, was supposed, before admission to hospital, to be suffering from tonsillitis. Ten years ago the patient had been for three weeks on the surgical landing with violent epistaxis, under Sir Philip Smyly's care. He was then so weak from hæmorrhage—for when his nostrils were plugged the blood came from the ears—that Sir Philip described him to a friend as "the only dead man he had ever seen come to life again."

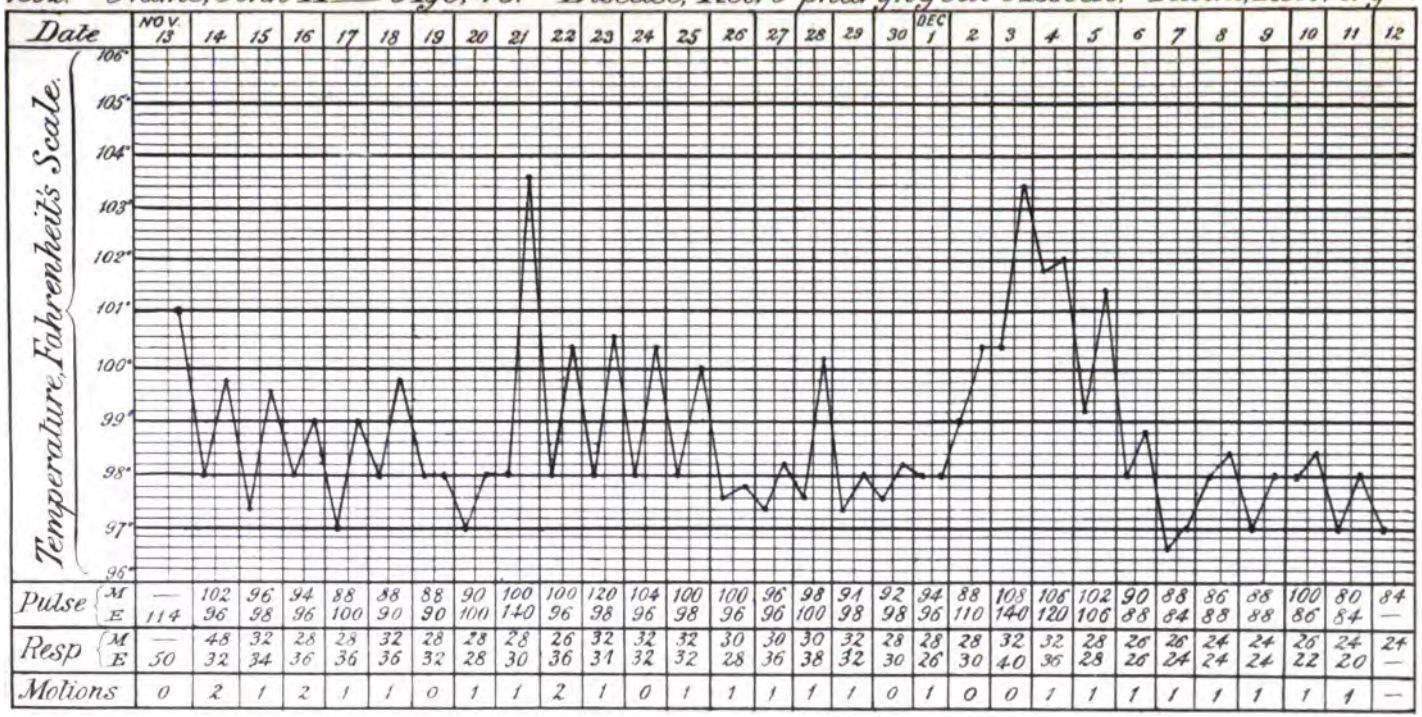
There was no return of the epistaxis after leaving hospital, and the patient says that he enjoyed perfect health ever since until three weeks ago, when from working in underground damp vaults he was promoted to the hot, draughty copper-room at the brewery. That night he felt a violent pain between his shoulders, and suddenly lost the power of his arms and hands. He began to cough, and after going to bed a fit of dry retching came on which lasted on and off for 24 hours; he felt his neck begin to swell, breathing and swallowing became difficult, and something like a hard lump in his stomach gave him much pain. A doctor was sent for next morning, who ordered hot linseed-meal poultices to be applied to the throat three times a day, besides doses and gargles, which seemed to do him little or no good, for the dysphagia and dyspnœa increased from day to day, and the patient became excessively weak from lack of nourishment, and was unable to be out of bed. For two days before coming in he was not able to swallow even fluids, the effort always bringing on a fit of coughing which was most exhausting.

Nov. 13th.—The patient was admitted at 4 o'clock this afternoon in a state almost of collapse; so weak that he can hardly stand. Breathing exceedingly difficult, quick and very noisy, like the sound of a water-wheel. Speech indistinct for some time, and afterwards at intervals the voice has a peculiar nasal tone, caused, no doubt, by the posterior wall of the pharynx being pushed forwards against the posterior nares, for it is evident that there is an internal

Chart No. 3

CLINICAL CHART OF TEMPERATURE

1892. Name, John K— Age, 45. Disease, Retro-pharyngeal Abscess. Result, Recovery



Date	NOV. 13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	DEC. 1	2	3	4	5	6	7	8	9	10	11	12
Pulse M	—	102	96	94	88	88	88	90	100	100	120	104	100	100	96	98	91	92	94	88	108	106	102	90	88	86	88	100	80	84
Pulse E	114	96	98	96	100	90	90	100	140	96	98	96	98	96	96	100	98	98	96	110	140	120	106	88	84	88	88	86	84	—
Resp M	—	48	32	28	28	32	28	28	28	26	32	32	32	30	30	30	32	28	28	28	32	32	28	26	26	24	24	26	24	24
Resp E	50	32	34	36	36	36	32	28	30	36	31	32	32	28	36	38	32	30	26	30	40	36	28	26	24	24	24	22	20	—
Motions	0	2	1	2	1	1	0	1	1	2	1	0	1	1	1	1	1	0	1	0	0	1	1	1	1	1	1	1	1	—

(which was actually in apposition with it) to the extent of half an inch. A gush of blood and pus took place into the mouth, followed by instant relief to the more urgent symptoms. I shall never forget the scene. Quantities of thick sanguineous pus poured from the man's mouth and nostrils; he began to draw deep breaths, which were ever and anon interrupted by fits of coughing, causing the pus and blood to splutter in all directions. Unable to utter more than the one word "Saved," the man grasped Mr. Ormsby's hand with a look of intense gratitude. Water was brought to him to rinse out his mouth, when, to our great disgust and even fear for the consequences, he swallowed it in deep gulps. Remonstrated with for doing so, he exclaimed, "O! sir, if you only knew what it is to be able to drink!" After the operation free venous hæmorrhage occurred, but it was checked by the hazeline spray and local douching with turpentine on pledgets of wool. The man was able to take "slops" freely during the day, and he slept well the following night. He continued steadily to improve. Beginning with "slops," he was soon able to eat bread soaked in water or milk or broth, egg-puddings, and in a few days meat. Pus continued to be coughed up for several days, but in daily diminishing quantity.

November 21st.—On the afternoon of this day the patient had a slight rigor, after which his temperature rose to 103·6°. Dyspnœa and dysphagia came on again, but less severely than at first. The man passed into a state almost of terror, and thought he was going to die. Two 5-grain doses of quinine were given through the ensuing night, and Mr. Alfred Power, the House Surgeon, at midnight made incisions in the throat where Surgeon Ormsby had made them before, and instant relief followed. The application of poultices was commenced again, and continued for two days; temperature fell next morning to 98° F. The flow of pus on this occasion was not nearly so copious as before, and stopped much sooner. The patient again improved, and in a few days could eat meat, though he remained in bed and often complained of sharp pain in his lungs, back, and side.

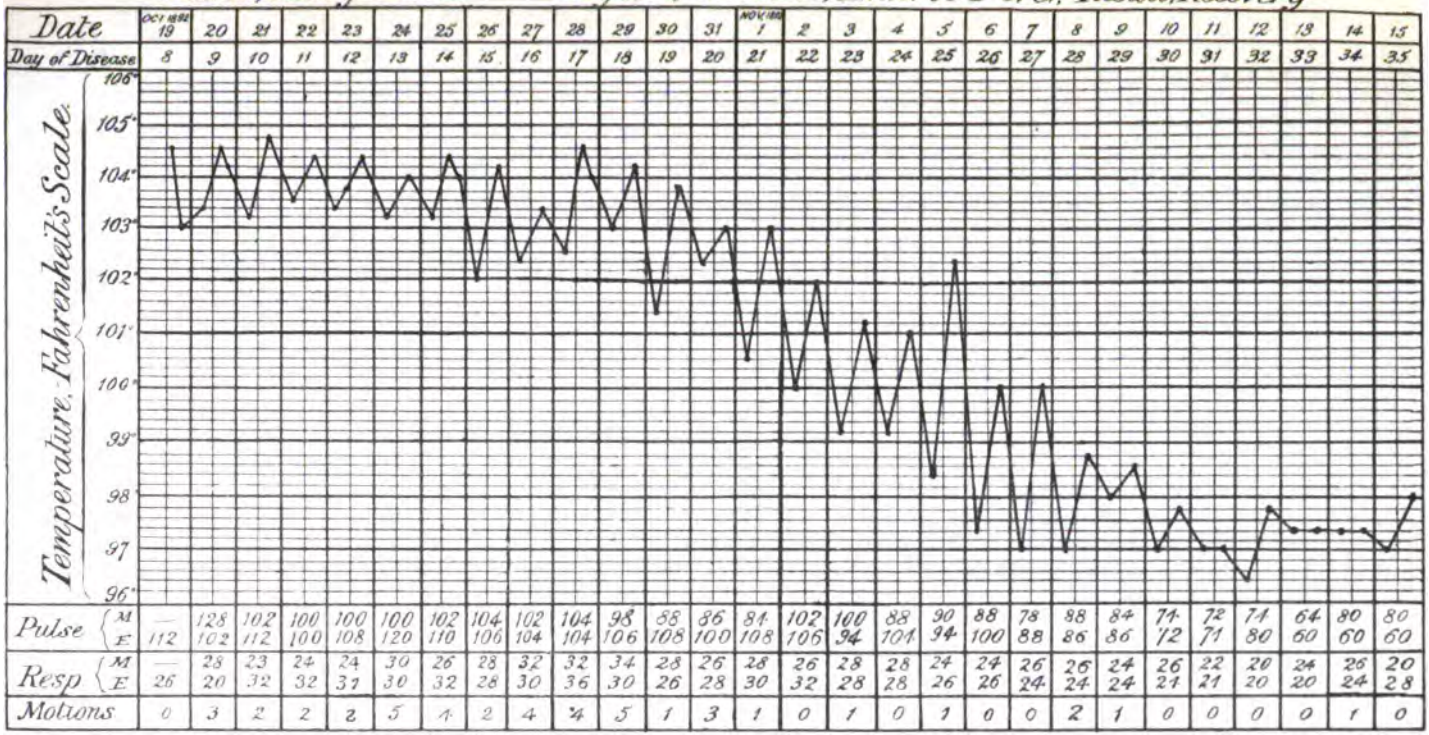
Nov. 28th.—He was moved up to the surgical landing to be under the care of Mr. Ormsby, being a surgical case. He complains of pain in the back, and says it feels weak, but otherwise he is wonderfully well and very bright.

Dec. 3rd.—Slight rigor in the afternoon; temperature in the evening, 103·4°. Complains of his throat, and has much difficulty

Chart, No. 4

CLINICAL CHART OF TEMPERATURE

Name, Mary Ann B Age, 19, Disease, Enteric Fever, Result, Recovery



Date	OCT 1892 19	20	21	22	23	24	25	26	27	28	29	30	31	NOV 1892 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Day of Disease	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
Pulse M	—	128	102	100	100	100	102	104	102	104	98	88	86	84	102	100	88	90	88	78	88	84	74	72	74	64	80	80
Pulse E	112	102	112	100	108	120	110	106	104	104	106	108	100	108	106	94	104	94	100	88	86	86	72	71	80	60	60	60
Resp M	—	28	23	24	24	30	26	28	32	32	34	28	26	28	26	28	28	24	24	26	26	24	26	22	20	24	26	20
Resp E	26	20	32	32	31	30	32	28	30	36	30	26	28	30	32	28	28	26	26	24	24	24	21	21	20	20	24	28
Motions	0	3	2	2	2	5	4	2	4	4	5	1	3	1	0	1	0	1	0	0	2	1	0	0	0	0	1	0

in swallowing and breathing. Throat poulticed during the night, and hot drinks given freely.

Dec. 4th.—Mr. Ormsby re-opened incisions made before with the same results as on the two former occasions; less pus than before. Poulticing continued for two days, then patient was able to eat meat again.

Dec. 13th.—Up to-day for the first time; pain in the back still continues, but he seems better than he has been since coming to hospital.

Dec. 18th.—The patient left hospital on this day, apparently quite well.

Remarks.—The ætiology of the retro-pharyngeal abscess in this instance is not very clear. There was no evidence of spinal caries, and the complete recovery of the patient is against the supposition of any such exciting cause for the attack. The man was admittedly of intemperate habits, and the painful nature of his illness, even from the outset, suggests that the case was really one of erysipelas of the pharynx, followed by diffuse cellulitis and suppuration. The physiognomy of retro-pharyngeal inflammation was well shown in this case. The torturing dyspnœa, complete dysphagia, tilting forwards of the larynx and trachea as well as of the lower half of the face, and the swollen state of the submaxillary regions, and indeed of the neck itself down to the clavicles, made up a diagnostic picture which I can never forget. The signal and instantaneous relief afforded by operation is also indelibly fixed in my memory, and the happy termination of the case is a matter for congratulation.

I should not forget to mention that œdema of the glottis had been suspected before I saw the patient, but the absence of aphonia and the comparatively perfect articulation led me to pronounce positively against such a diagnosis.

Case IV.—*Scarlatina supervening upon Enteric Fever.*—Mary Ann B., aged nineteen, a domestic servant, unmarried, was admitted to the epidemic wards of the Meath Hospital, October 19,

1892, on the ninth day of a normal attack of typhoid fever. The accompanying Temperature Chart (No. 4) admirably shows the course of the fever, which calls for no special comment. She became permanently apyrexial on November 9, the twenty-ninth day of her illness. On Tuesday, November 29th, she went upon two occasions into the ward kitchen. She there met a patient convalescent from scarlatina, but still desquamating slightly, and remained in the room with the same for some 15 minutes. The day following she sickened, feeling unwell for the first time at 12 o'clock noon. Her symptoms were—headache, pain in the pit of the stomach, malaise, and sore throat. Next morning (the third day, inclusive, after exposure to infection), the rash of scarlatina had already overrun the greater part of the body. The attack proved a mild one, except that there was a very marked secondary infection of the cervical glands, which caused an equally pronounced secondary fever. This is well shown in Temperature Chart No. 5. It is interesting to note that the glandular swellings, which were most prominent on the left side of the neck where an attack of diffuse cellulitis was apparently impending, yielded readily and at once to the diligent application of ice poultices.

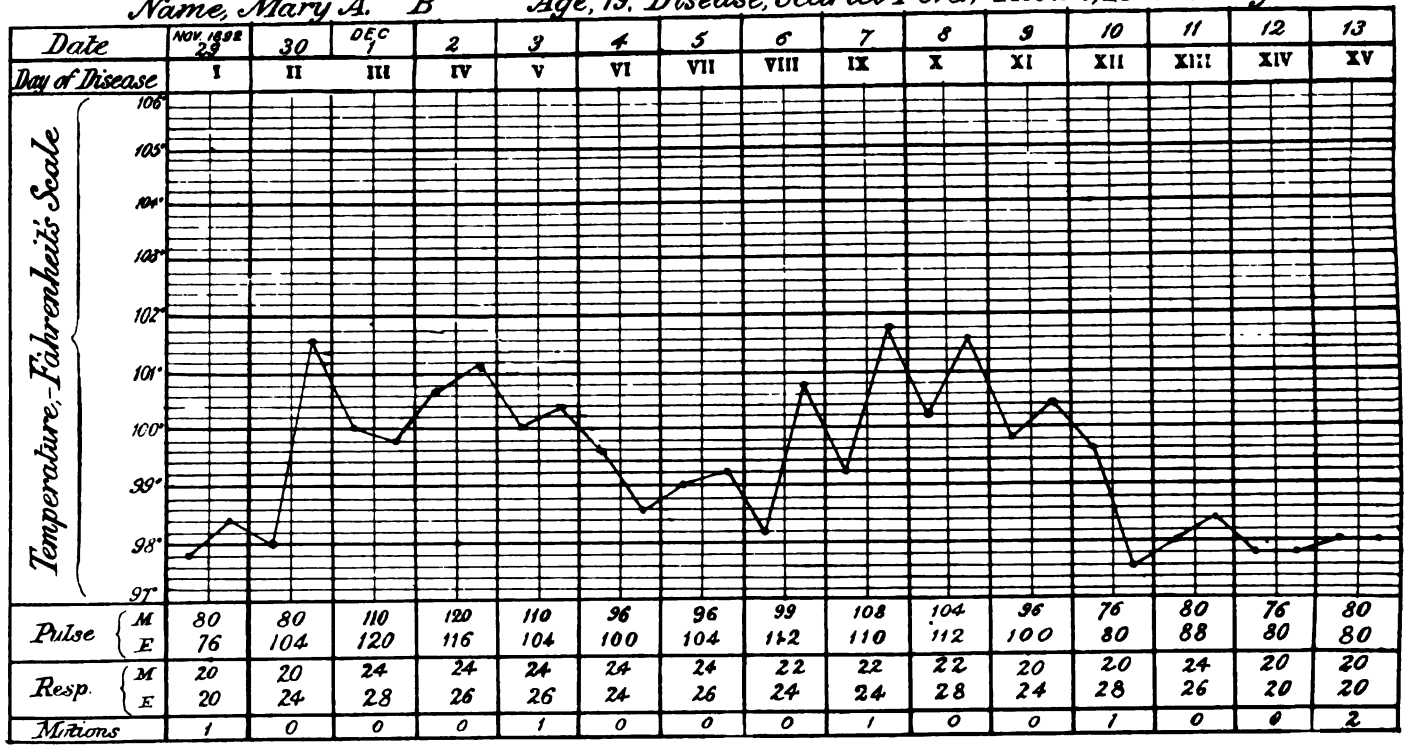
Remarks.—My object in bringing forward this case is to draw attention to—first, the increased predisposition to one infectious disease which the presence of another causes; secondly, the shortness of the periods of both incubation and invasion in scarlatina under such circumstances. It would seem as if the mucous membranes and glands had lost their power of resisting the invasion of pathogenic micro-organisms in the later stages of enteric fever. One may regard the infecting process under such conditions to be one of inoculation rather than of ordinary infection.

CASE V.—*Pulmonary Emphysema—Aortic Valve Disease—Aortic Aneurysm bursting into the Pericardium.* (From notes by Mr. George P. Moore, Clinical Clerk, and Mr. Charles E. Hodgson, Case-taker.)—The last case of the present series is that of a shoemaker, David R. by name, a widower, aged sixty-two years, who was admitted into ward 12 of the Meath Hospital under my care on October 14th, 1892. The patient was a native of the Co. Kildare.

Chart. No. 5.

CLINICAL CHART OF TEMPERATURE.

Name, Mary A. B Age, 19. Disease, Scarlet Fever. Result, Recovery.



Date	NOV. 1892 29	30	DEC 1	2	3	4	5	6	7	8	9	10	11	12	13
Day of Disease	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV
Pulse M	80	80	110	120	110	96	96	99	108	104	96	76	80	76	80
Pulse E	76	104	120	116	104	100	104	112	110	112	100	80	88	80	80
Resp. M	20	20	24	24	24	24	24	22	22	22	20	20	24	20	20
Resp. E	20	24	28	26	26	24	26	24	24	28	24	28	26	20	20
Mictions	1	0	0	0	1	0	0	0	1	0	0	1	0	0	2

He had worked constantly at his trade for forty-four years. His family history calls for no remark. He admitted that he had been of very intemperate habits up to some four years ago, when he was *obliged* to give up drinking—at all events to excess—owing to impaired health. Very little liquor would then intoxicate him, and also cause nausea. There was no history of rheumatism or of syphilis, and the man assured us that he had enjoyed good health up to some five winters ago, when he began to suffer from difficulty in breathing. This symptom subsided or disappeared in summer to return in each succeeding winter season. About six months ago he became subject to attacks of pain of a gnawing character across the front of the chest. Three weeks before admission he observed "a lump" over the upper part of the right side of his chest near the breast-bone. This lump produced a throbbing feeling when he placed his hand over it. Shortly afterwards he consulted Dr. John A. Johns, who advised him to enter hospital.

On admission the patient's chief complaint was of difficulty of breathing. Expiration was much prolonged. The thorax appeared full, almost barrel-shaped, with rigid sides. The percussion note was hyper-resonant over the infra-mammary regions, so that a diagnosis of emphysema of the lungs was made. But this was not all, for on proceeding to examine into the state of the circulation a further diagnosis of aortic regurgitation became easy. Thus, a well-marked diastolic murmur was heard down the sternum, taking the place of the aortic second sound; there was also a less distinct systolic murmur, which was carried into the carotids and subclavians. There was a collapsing pulse at the wrists, and in the carotids the presence of visible pulsation could be recognised, although it was not pronounced. The usual depression in the sternum incidental to his occupation of shoemaker was very noticeable. In the second right interspace a fulness was observed, corresponding to an area of dulness on percussion which was about two inches in diameter. This is represented in the Plate. A distinct throbbing was both seen and felt in the same place, so that a diagnosis of aneurysm of the ascending portion of the thoracic aorta was in the third place arrived at. Soon after admission the aneurysmal pain became very intense. It was relieved by occasional leeching and the administration of opiates at night. After two weeks' stay in hospital an attack of cystitis occurred. It was attended by abundant deposits of pus in the urine, but soon yielded to treatment—a mixture of benzoate of sodium, nux-vomica,

and infusion of buchu quickly clearing the urine. Albuminuria, however, persisted, being due rather to cardiac failure than to nephritis. On November 20th, Esbach's albuminimeter gave 1·75 grammes of albumen per litre, the amount rising to 2 grammes per litre on November 26th.

The patient continued fairly well until a week before Christmas, when sleeplessness and pain began to tell on his strength. Eczema appeared on the backs of the hands and on the forearms. The bitter cold of Christmas killed him, as on December 28th after taking a cupful of beef-tea, about 12 noon he lay down as if to sleep, and was found in this position dead about half an hour afterwards.

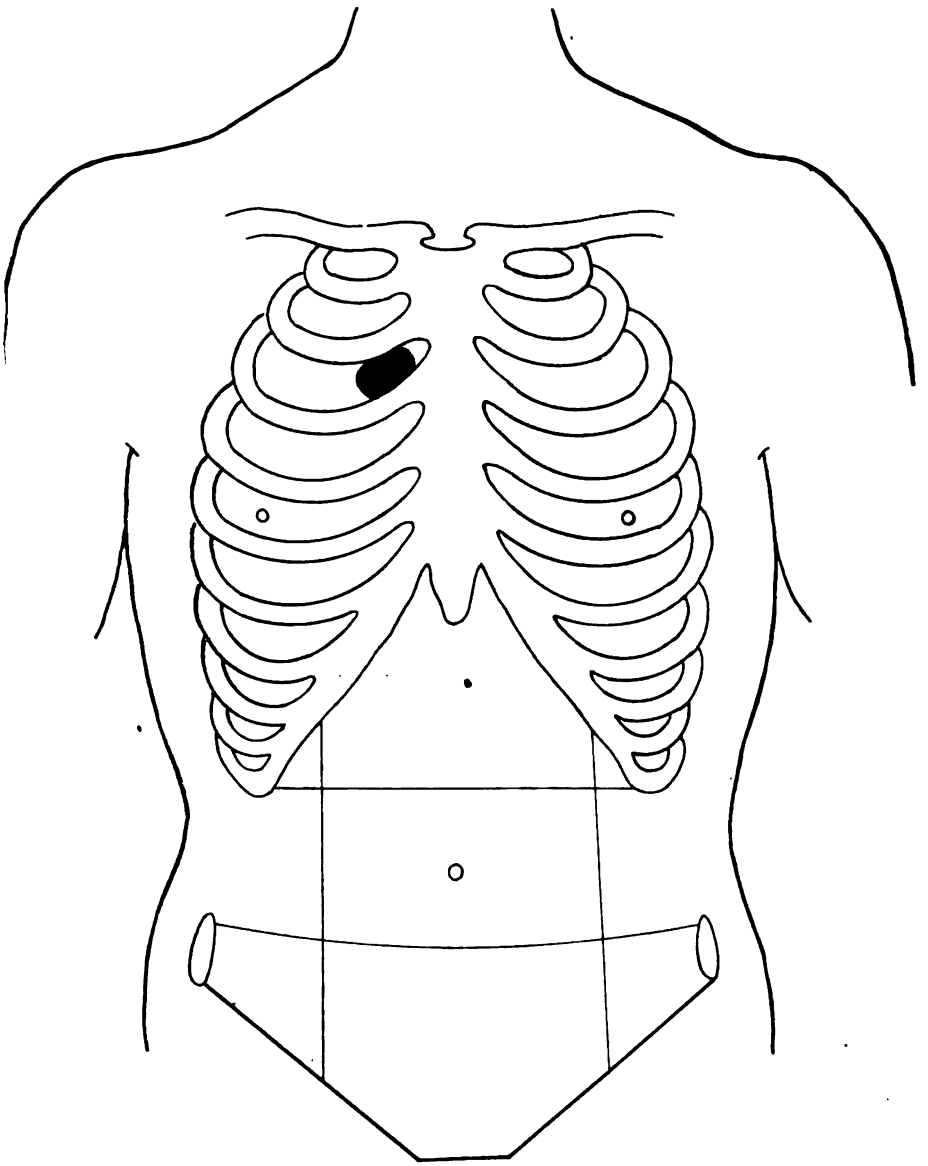
The *post-mortem* examination was made on the following day. The right pleura was in places much thickened and adherent. The upper lobe of the right lung was largely collapsed and airless. Extreme emphysema existed along the inferior margins of both lungs.

The pericardium was full of blood, which had poured into this sac from an irregular rent in the wall of a sacculated aneurysm of the ascending aorta. Anterior to this a large false aneurysm was found. The entire length of the thoracic aorta was in a state of advanced atheromatous degeneration, with calcareous plates here and there. Bead-like atheromatous projections also existed on and near the aortic valves, which were both obstructed and manifestly incompetent. Notwithstanding this, the heart was neither hypertrophied nor dilated.

Remarks.—I have already, during the present Session, laid before the Pathological Section of the Academy a case of fatal rupture of a thoracic aneurysm into the left lung and pleura. In the present instance, rupture took place into the pericardium and the man died—not, as in the former case, of hæmorrhage, but from stoppage of the heart through the pressure of the effused blood.

PLATE

DAVID R



THE TREATMENT OF PULMONARY CONSUMPTION IN SPECIAL HOSPITALS AND DISPENSARIES.

By JOHN KNOX DENHAM, L.R.C.P., L.R.C.S.;
Medical Officer, Donnybrook Dispensary;
Surgeon to the Dublin Orthopædic Hospital.

[Read in the Section of Medicine, January 27, 1893.]

THERE is no doubt that the views of the inevitable character and the incurability of pulmonary consumption are now altered, and it is admitted that phthisis is both preventable and curable. Although pulmonary consumption carries off, at ages between fifteen and forty-five, more than one-third of the people who die, and between fifteen and thirty-five nearly one-half, yet the Registrar-General's Reports show that in the last 30 years the annual rate of mortality from phthisis has been reduced by more than one-third. Notwithstanding this enormous death-rate, there is no efficient machinery at our disposal to cope with it.

A very large proportion of the patients suffering from pulmonary consumption come from the poorer classes, and in Dublin every dispensary is crowded with such cases; and I purpose very shortly to review the methods adopted in Dublin in dealing with such cases, and to inquire if those methods are the best available.

No feature in the modern treatment of consumption has received so much attention—and deservedly so—as that which involves on the patient residence abroad, and the literature on climatic treatment is large and exhaustive. A sea voyage or a winter in the south of France is reserved for rich people, and my remarks apply only to the treatment

of the poor. In treating poor consumptives, we are limited to the following:—1. We can treat them as out-patients at the dispensaries. 2. We can treat them as in-patients in the large general hospitals. 3. We can treat them at their own homes.

In the first place, we all know that the amount of work to be done at a dispensary is very great; that the pressure on the time of the physician is seriously felt. In the majority of tubercular patients at the dispensary serious symptoms, such as pyrexia, hæmoptysis, diarrhœa, are present, together with some cases of early or even doubtful tubercular nature; and from my experience in connection with general dispensaries, I am satisfied that such patients cannot be expected to receive adequately the special consideration their cases deserve. Further, the waiting-rooms of most dispensaries are, in my opinion, not at all suitable for serious tubercular cases to be kept waiting in, often for a very considerable time, especially when we remember that they are crowded with numerous other patients. I have never seen any special care taken in dispensary waiting-rooms to provide disinfecting spittoons, nor am I aware that any special disinfection of the waiting-rooms is a routine.

Secondly, patients suffering from pulmonary consumption are treated as in-patients in our large general hospitals. I would observe that from inquiries I have made, such patients are admitted as seldom as possible, unless very urgent symptoms are present, or they are strongly recommended by friends of the hospital. In clinical hospitals it is obvious that to have a preponderance of tubercular patients would not do; besides, from our present knowledge of the peculiar requirements of such patients, it is doubtful whether they are greatly benefited by being treated in a general ward.

As an example, the highest authorities on the subject lay down that each patient should have a fresh supply of air

entering at the rate of 4,000 cubic feet per hour, at 62° F., independent of windows and fire-places, also that mean should be supplied to carry off the foul air through extracting flues built in the walls. It is considered essential that as much sunlight as possible should be obtained; this is provided by glass verandahs, &c. An exceptionally liberal diet is another essential. Independently of the views that may be held regarding the undesirability of placing patients with pulmonary consumption in a general ward, it is evident that none of the wards of Dublin hospitals, as at present arranged, fulfil the modern requirements necessary to the successful treatment of such patients.

I do not intend to touch further on the subject of a special hospital, because that is in a fair way of accomplishment. I am informed that the hospital is to be built in or near the Vale of Ovoca. This decision I deeply deplore, for I feel that it will benefit Dublin only slightly, and the patients will be deprived of the advantage of treatment by the most eminent physicians.

Parenthetically, I might state that the subject of special hospitals for consumption was fully discussed at the Tenth International Medical Congress in Berlin.

Dr. Philip, of Edinburgh, in a letter to me some little time ago, says, everything points to the advisableness of a consumption hospital being placed on suitable ground near rather than within the city. As you know, this was the unanimous view adopted at an immense meeting of the Medical Section of the Tenth International Congress at Berlin, 1890, when representatives of all nations made communications. Comparatively recently Professor Leyden has induced the medical authorities of Berlin to combine together for the founding of special hospitals for consumption, and Austria has taken the same move, under the leadership of Prof. Schröetter, who is arranging for the building of one

or more such hospital in or near Vienna. Accepting this as a correct statement of fact, it disposes of all argument against a special consumption hospital, based on grounds of our being over-hospitaled, or that such an institution would tend to starve existing charities. If we decide that a special hospital is a necessity for our sick poor, I have no fear but that the money necessary will be gladly subscribed without injuring any existing charity.

Now as to the treatment of the patient in his own home. It is here that our greatest difficulties face us. No matter what development may take place on the lines of special dispensaries or special hospitals for many years to come, the majority of patients will have to be treated in their own homes. It is unnecessary for me to say much about these homes of the poor in our city and suburbs, and, without in the least underrating the splendid work done in the city both by the Corporation and other bodies in improving the dwellings of the poor, still no artisans' or labourers' dwelling gives a consumptive the best chance.

So seriously is the physician handicapped, that, while doing his best for the individual patient, his main efforts must be made in the direction of protecting the other members of the family, and doing his best by the adoption of stringent hygienic measures. A patient suffering from scarlatina, a disease which has a trivial death-rate compared with that of consumption, is treated as a very dangerous individual; we isolate him, we disinfect him and his dwelling, and destroy his bedding and clothing. Yet our consumptive patients are allowed to suffer and die, without any means being taken to prevent the disease spreading from the infected area and infected dwelling.

Having briefly, and in a very fragmentary manner, shown the means at our disposal for the treatment in Dublin of pulmonary consumption, I will conclude by offering the

following deductions for the consideration of this Section of the Academy.

I am of opinion that a special hospital for consumption, in or near Dublin, is necessary, and I deplore the decision to place it at such a distance from the city.

Consequently, I believe that we urgently require a properly equipped dispensary in the centre of the city for the special treatment of diseases of the chest.

Also, that to the management of the Queen's nurses for the sick poor a special representation should be made, urging them to direct that particular attention should be paid by their nurses to the laws governing the prevention of consumption.

And finally, that if pulmonary consumption is to be eradicated from our midst, which I believe to be ultimately possible, it must and can only be done by the most energetic action on the part of sanitary authorities, treating pulmonary consumption as one of the most dangerous of infectious diseases.

Dr. Nixon said that cases of consumption amongst the poor might be divided into those which are curable and those which, although incurable, might be relieved as regards the most distressing symptoms, and have their lives prolonged. The cases coming under the first class were very few. There was not a sufficiently good combination of circumstances as regards climate to give them a favourable chance of recovery while resident in Ireland. The idea of erecting a hospital to treat these patients is mythical. He thought it was better to send them to high mountain regions—to Egypt or to Australia. The second class of cases can be well treated in the wards of a general hospital, requiring, as they do, a good bed, good food, rest, and not too much medicine. These cases would not be admitted into a special hospital for consumption. The last Commission for inquiring into the Dublin Hospitals stated that Dublin was the most over-hospitaled city in the three

kingdoms. He wished to call attention to the fact that although the number of beds was large, many of them were kept vacant owing to want of funds. It would be better to spend the money in filling these beds than in building a new hospital.

Dr. J. W. Moore said that he agreed in the main with Dr. Denham, but differed *in toto* from Dr. Nixon. He thought the climate of Ireland fulfilled all the desiderata for the treatment of consumption which were asked for by Dr. Nixon, with the single exception of humidity, more so than any other place. Its temperature is most equable, and there is abundance of fresh air. The only drawback is the dampness, both of the air and of the soil. He thought that patients belonging to Dr. Nixon's second class should not be admitted to a special hospital whose object was to give those who had a fair prospect of cure a chance. These patients could be received into the Royal Hospital for Incurables or into the Hospice for the Dying. In the proposed new hospital each patient would have a separate sleeping apartment. He did not think Dublin was over-hospitaled, as it received patients from all Ireland. The proposed site of the new hospital is three miles inland from Newcastle, county Wicklow. He thought the arrangements in our city dispensaries, in the extern departments of our hospitals, and in the wards themselves were 50 years behind the time.

Dr. Broomfield remarked that whatever Dr. Moore's views were as to the climate of Ireland being suitable for the treatment of consumption, it was very suitable for its development. He thought that the new hospital should be for the incurable cases, as they would thus be isolated and infection limited.

Dr. Ninian Falkiner thought that cases of phthisis should be removed from crowded tenement rooms; and if this were done the death-rate from consumption would be lower.

Dr. Bewley thought the new hospital would be insufficient to relieve the other hospitals. Phthisis lasted a good while, and patients did not like being taken away from their homes for a year.

The Chairman (Dr. Hawtrey Benson) agreed with Dr. Moore as regards the climate of Ireland.

Dr. Denham, in replying, said that when he commenced to investigate the subject of the new hospital he was strongly prejudiced against it, but that as he proceeded in the study of the subject he became a firm believer in it. He thought ordinary hospitals were defective for treating consumption in the following

points:—First, the temperature was not constant; secondly, the cubic space allotted to each patient was insufficient; and thirdly, the diet was unsuitable. He thought the patients suitable for admission to the new hospital would be those in whom the physical signs were not marked. He again repeated the decision of the Tenth International Medical Congress held at Berlin, which was strongly in favour of treating pulmonary consumption in special hospitals.

SUBJECTIVE OZÆNA.

By JOHN KNOTT, M.D. (Univ. Dubl.)

[Read in the Section of Medicine, March 3, 1893.]

The cases to which I have ventured to call the attention of the Medical Section this evening are, I think, of some interest in the study of functional nervous disorder. They are not, so far as I have been able to ascertain, of frequent occurrence. It is, however, hard to form an opinion on this head from the number of published reports, as the greater number are, I have no doubt, consigned by the busy practitioner to the limbo to which are relegated the notes and recollections of his uninterestingly troublesome cases of general hypochondriasis. They are, nevertheless, I venture to think, well worthy of their share of consideration, from the light which they throw on the great influence of apparently trivial ailments on the mental and physical capabilities of the individual. Sufferers from functional derangements of an organ of special sense have sometimes had their minds permanently unhinged by the depression produced by continually brooding over their condition. Some have sought in suicide the relief which medical skill failed to bring. Such considerations form, I think, a sufficient plea for the attentive study and careful record of hallucinations of the special senses.

Of this group of neuroses, none appear to affect the patients' mind to a greater degree than those of hallucinations of the sense of smell. Of cases of this kind, characterised by the persistent sensation of an offensive odour I have met with four striking examples during the past few

years, and have ventured to describe them under the name given at the head of this paper:—

Case I.—The first of these, A. B., a native of Dublin, consulted me in May, 1889. He was a slightly built man, aged 34, height 5 feet 5 inches, weight 10 st. 2 lbs. His head was inclined slightly to the hydrocephalic shape. He was very intelligent when questioned, but very timid and hesitating in manner, and evidently dominated by some fixed—and ponderous—idea. He entered my study in a very apologetic manner, stooping a little forward. I happened to have a cold at the time, and sneezed as he advanced towards me, which seemed to distress him greatly, and made him at once begin to offer excuses for having disturbed me, as he was afraid that his presence was very unpleasant to me. This surprised me a little, so I tried to assure him that I was very glad indeed to see him. He said he thought this very kind, but that he felt I knew his presence in the same way that all people did, as I sneezed the moment he entered the room. This surprised me still more; so I asked him to sit down, and tell me what was the matter. As he sat down, I coughed rather violently; this had the effect of making him start up at once, and say very meekly that he thought he ought to go, as this was really one of his worst days, and he was afraid I could not bear his presence. As I saw he was in a rather feeble state of mind, to say the least, I pressed him back into his chair, and assured him, as earnestly as I could, that his presence was by no means distasteful to me, and that I could not even understand why he thought so. I asked him to tell me what was the matter without further hesitation, and he proceeded to inform me that for about three years he had been affected with a continuous sensation of a bad smell, which not only annoyed himself, but made his presence intolerable to other people. He had been assistant and accountant in the houses of several booksellers, but since his present affliction he had changed his employers several times, as he had felt that his presence could not be borne by others, on account of the odour which emanated from him. His fellow-workers always coughed, or sneezed, or yawned when he approached them, and persons entering the shop displayed the same symptoms of dislike or disgust. He was so much disheartened by this state of things that he had given up work altogether, and for the past five months had been living on his small savings, so that he did not know what was to become of

him when his money was spent. He could not attempt to go to church or to any public meeting, or to mingle with a crowd, because people began to cough, and sneeze, and yawn when he came near them.

When he got so far I myself yawned, quite unconsciously, and he at once begged my pardon for his offensive presence, but hoped that, as a medical man, I would forgive him for the infirmity which he could not help. I assured him that his presence was not at all disagreeable to me, and that he was entirely mistaken in attributing my yawning to any odour which I felt. He said that he was sure I said this in order not to hurt his feelings. I tried to reassure him, but did not at all seem to succeed. He then proceeded to tell me that the sensation had been continuous since it first appeared, but was much worse at times; that he felt what he thought like waves of bad smell come along a nerve from his heart, along the left side of his chest, to his throat, and so up to his nose. At the same time he felt a corresponding agitation passing along the nerve from his heart to his penis. He believed there was some definite connection between these organs and the smell which so much annoyed himself and everybody he met. His digestion was, he told me, tolerably good, and his bowels were fairly regular, but he did not sleep well on account of the state of his mind. He lived in lodgings alone, and approached nobody, except it was absolutely necessary, on account of the symptoms of disgust which they displayed. He could not think of travelling in a railway train with another person in the carriage, and never entered a tram-car, because he could not be sure of having an empty one at any hour of the day. Persons passing him in the street drew away from him, and coughed, and sneezed, or yawned, or used their pocket-handkerchiefs. Here I again expressed some doubt as to the accuracy of his surmises, and assured him that I had noticed no bad smell since he had entered the room. While speaking I got a rather severe fit of coughing, and he at once broke in with: "But you are coughing now, and I know it is because I am here." I tried to assure him that this demonstration was entirely due to the fact that I had a cold, but he told me that he knew I only meant to be kind, and did not seem to believe a word I said. He was sure there could be no mistake about his own view of his condition, and he knew that he always left a suffocating odour in a room on leaving it. When he left his own room he had often noticed, on returning after a short absence, that if his landlady had entered

she had found it necessary to open the window to allow the bad smell to escape. Even horses seemed to dislike his presence, and turned away or shook themselves, or stretched their necks as he passed. He was sure that his vicinity was disagreeable to animals as well as to man. He could not on any account think of seeking any new employment, because he was sure that any one to whom he applied would at once notice the smell which emanated from him, and decline to have anything to do with him. He had practised masturbation occasionally between the ages of 18 and 20, as well as he could remember, but never since. He had had an attack of gonorrhœa when about 21, but had never had syphilis. He had occasionally—very occasionally—a seminal emission; of course he "could not think of approaching any female now with this smell coming from him." Such was his description of his own symptoms.

Apart from the absorbing idea of the smell, this man was intelligent and rational. He had been an extensive reader, and since his malady developed he had more especially taken to books—to obtain, if possible, information about the sense of smell, and the properties and phenomena of the nervous system. He had consulted a great number of doctors, and been to several hospitals, but would not give the names either of the professional gentlemen whose advice he had obtained, or any of the institutions of whose aid he had availed himself. He had, however, carefully noted all the treatments which had been suggested or recommended, and had accumulated a remarkable list of them. Most of the recognised tonics and sedatives had been given internally. Locally he had been treated with lotions and sprays of carbolic acid, of salicylic acid, of sulphuric acid, of Condy's fluid, of corrosive sublimate, of mercuric iodide, of chloride of zinc, and so on. He had used menthol snuff, and had been treated to inhalations of small quantities of chlorine vapour. All had in turn failed; his medical attendants, he said, soon got tired of him; and he had no doubt that it was on account of the offensive smell which emanated from him. He was even anxious not to stay too long with me, because he felt sure that I would have to do something to purify the air of the room after he left, before anybody else could be allowed to enter it. The back of his throat had been frequently cauterised, as it was supposed that local ulceration might be the source of the smell. As he went about from one hospital to another, more radical measures were sometimes suggested; he remembered having heard such surgical procedures discussed as: exploration of the cavity of the antrum

removal of Meckel's ganglion, and trephining—over *Broca's space*, or somewhere near it. He had, however, a very strong repugnance to operations of every kind.

As the case did not seem likely to prove a satisfactory one, I advised him to begin by attending to his general health; and did all I could, although with very little apparent result, to persuade him that his presence was not quite so offensive as he thought. So far as the evidence of my senses went, there was nothing specially offensive about his breath; but he at once waived all assurances of this kind by telling me that he was sure I only meant to be kind in saying that I was not disgusted by the smell, but he knew the contrary too well. I coughed occasionally throughout the interview; and he always directed my attention to the incident, as a proof that I was affected in the same way that others had been. I did not press my assertions, as they rather annoyed him. I prescribed sulphonal at night (four of Burroughs, Wellcome & Co.'s tabloids). with the hope of calming his nervous system, by procuring better sleep. I also gave him a mouth-wash containing a little permanganate of potassium, although I did not expect any definite results from it, as the symptoms were, obviously, altogether subjective, Three days later I saw him again: he did not seem quite so depressed about himself, and I tried to persuade him that there was an improvement. He had slept well, and appeared calmer.

I then prescribed a mixture containing nux vomica and cannabis indica, and tried to encourage him by assuring him that the medicine would have a good effect on his nervous system generally. He was to continue the mouth-wash. When I saw him again, after a week, he really appeared in better spirits, and told me that the smell did not appear quite so bad to himself, but passers-by noticed it just the same although they did not, perhaps, cough and sneeze and use their pocket-handkerchiefs quite so frequently. I thought that I would try the effect of a strong galvanic current; and, accordingly, applied it for ten minutes, with one pole in a nostril, while the other was moved about over the face, and side and back of neck. Five minutes were given to either nostril. He was very quiet and attentive during this experiment; it evidently took his fancy a good deal, as it had not been tried before. He told me, when I had finished, that he thought there was less smell, and seemed to feel more hopeful. I directed him to continue the mixture. Three days afterwards I repeated the galvanism; he then told me that he thought the smell had been less for rather more

than a day, but it had returned. As his bowels were rather confined then, I changed his mixture for one containing aloes and iron. For four subsequent visits the galvanism was repeated, as he said that it was the only thing which had been tried that seemed to give him even temporary relief. The progress was not, however, satisfactory; and evidently depended on the novelty, and on the partial diversion of his ideas into a new channel. I had changed his mixture to one containing chloral and potassium bromide in large doses, but it did not affect his symptoms. I had almost decided to tell him there was no use in his visiting me again.

At that date several persons, patients and others, had been asking me what I thought of hypnotism as a treatment for nervous symptoms; and, during one of these discussions, the idea occurred to me that I would try hypnotism with this patient before giving him up in despair. Accordingly, at his next visit, I suggested the idea to him, and he seemed delighted with the chance of having the "new foreign treatment" practised on him. He was ready to try anything, short of a severe surgical operation (of which he had a fixed horror), that gave him any hope of getting rid of his depressing malady. I found him an ideal subject for hypnotic influence; and, on awaking him from his state of induced somnolence, I stroked him for a couple of minutes along the skin in the direction in which he said that he always had felt the sensations passing up to his nose. I told him to take his sulphonal tabloids at night, and to come again after an interval of two days. When he returned he was in much better spirits; he told me that the nerve which had always been carrying the bad smell up to his nose was much quieter, and that he had felt very little in connection with it since. He was confident that the right remedy had been adopted at last, and felt sure that the stroking along the course of "that nerve" had been of special service. The operation was repeated four times, at intervals of three days each, and at the end of that time he was sure that the offensive nerve had been quieted—he had scarcely noticed any odoriferous sensations travelling along it for a week. He felt that he was in a fit condition to resume work; and, as he did not care to stay in Dublin, on account of the small chances of lucrative employment, he had decided, he said, to emigrate immediately. His last visit was paid on a Monday: he had been at church the day before, the first time, he said, for three years. He was very nervous on entering church, on account of his former recollections of the number of coughs and sneezes which

he had always provoked, but nobody seemed to mind him on this occasion. He professed great gratitude for the result of my treatment, but I have not heard from him since, although I specially requested that he would write to me.

Case II.—The second case of this kind which came under my notice was in the person of a policeman—in size and general development a fully representative member of the Metropolitan B Division. Like a great many members of this profession whom I have met with, he had developed a considerable variety of bilious and nervous symptoms. When he consulted me, in May, 1891, he had belonged to the force for nearly eleven years. He had originally come from the west of Ireland. He told me that he was often sorry that he had left the country life, for he found that neither the city nor duty as a policeman agreed with him. His employment as a public guard became very monotonous after the first couple of years. He suffered from dyspepsia, was often afflicted with insomnia, found considerable difficulty in keeping his bowels regular, and was frequently troubled with bad occipital headaches. He was an immense fellow to look at; but, on closer examination, his tissues appeared rather spongy in texture, and there was a general deficiency of nervous and muscular tone. He often felt very lonely and depressed when alone on duty, but his prime affection was a persistent bad smell which he had observed to attend him for about half a year or so. His general description of the phenomena which attended it was ridiculously like that given by my former patient. All human beings, and many animals, especially horses, were affected by his approach in the same way. Within the fortnight before his visit he had been obliged, in the course of his duty, to arrest two persons for drunkenness in the street. Each of them had displayed the greatest repugnance to his presence, and each of them vomited within a few minutes of the arrest.

As in the other case, he had practised masturbation for some years, but had given it up on joining the Constabulary. He had never attempted sexual intercourse till he came up to the depôt for his preliminary training. Even since, he had never indulged to excess. He sometimes noticed that the odour was much more decided when he was affected by sexual excitement. His appetite and digestion were fairly good. His articulation was rather slow; but I did not observe any other nervous peculiarity, excepting the evidences of the dominant idea that he was afflicted

with this persistent bad odour. It was worse at some times than at others, and was most felt at the times when he happened to suffer from insomnia. Still, the case did not appear to be at all so aggravated in character as the one which I have already described.

I thought it best in this case, as in the former, to commence the treatment by the use of a placebo in the form of an antiseptic mouth-wash. I also brushed the back of the throat, and syringed the nostrils. The use of menthol snuff was prescribed. For internal use a mixture of equal parts of mist. fer. aromat. and decoc. aloes co. was given. He looked much too obstinate and suspicious an individual to form an eligible subject for hypnotism. Accordingly, I did not suggest it. I saw him regularly once a week for about five months. Four sulphonal tabloids were taken every night for the first week. After about three weeks he commenced to admit that his general health had been greatly improved by the medicine. His thoughts were not so continuously concentrated on the offensive smell. At this date I commenced to use the galvanic current, and used it regularly once a week afterwards during the treatment. The application was followed by some slight improvement. I then gave a mixture containing nux vomica, belladonna, cannabis indica, aloes. Blaud's pills were at the same time prescribed. This treatment was continuously employed for the next three weeks, during which the general tone of the patient's system underwent marked improvement. The offensive odour also annoyed him less; although it was never completely absent, and was sometimes worse, especially when he did not feel so well as usual. As his general condition was then so much improved, the mixture was changed for one containing small doses of tinct. chloral. co., sp. ammon. aromat, and tinct. cardamom. co. This he used for about another month. The galvanism was regularly used all the time. During this treatment the general health continued to improve; the patient's spirits were much brighter; his appetite continued good; the bowels were regular; and he slept well. He still felt the sensation of the bad smell, but decidedly diminishing; it did not engross his attention in the way it used to. He now felt quite hopeful of an ultimate cure. The medicine was then dropped, but the galvanism was continued during the remaining time of the treatment. At the end of five months from his first consulting me he felt sufficiently well to discontinue his visits. He had almost ceased to notice the offensive smell which had tormented him; although he still observed a slightly unpleasant olfactory sensation

on days on which he did not feel quite so well as usual: especially if he had been worried, or had not had sufficient sleep. I saw him from time to time for nearly a year afterwards; he occasionally felt an attack of depression of spirits, during which there was usually more or less of the old hallucination of smell present. These attacks were, however, nearly always traceable to want of sufficient sleep, fatigue, or worry of some kind, or neglect of the bowels. They were always amenable to treatment.

In neither of the above cases did there appear to be the slightest trace of any organic lesion—central or peripheral—to account for the peculiar and distressing symptom complained of. Both were individuals of but little nervous energy, and, in the case of the first, his mind had very obviously become quite unhinged on the subject of his affliction, although he was quite intelligent and reasonable on all other topics. In each case, there were some sexual symptoms connected with the predominant subjective sensation; neither however, appeared to have ever indulged to any considerable extent in venereal excesses. The intimate connection between the sexual instincts and the olfactory sensations in the lower animals is well known, and in the more animalised types of man peculiar evidences of this kind have been noticed, and from time to time placed on record. Romberg saw a case of a young man who sneezed violently whenever he had an erection of the penis; Mackenzie a case where symptoms of coryza, with copious discharge from the nasal mucous membrane, always followed any venereal excess; and Féré has recorded one in which a young man of twenty was troubled with persistent priapism whenever he got a cold in the head, and had so suffered even from the days of his boyhood. Cloquet quotes from *l'Etoile* (*Journal de Henri III.*) the narrative of the circumstances under which the Duc d'Anjou (afterwards Henri III.) became violently enamoured of Marie de Clèves on the night of her marriage with the Prince de

Condé. The princess had danced a great deal at the celebration of her own wedding, and at last found it necessary to retire to the "garde-robe où une des femmes de chambre de la reine mère lui fit changer la chemise. Elle venait de sortir quand le duc d'Anjou (Henri III.) y entra pour racommoder sa chevelure, et s'essuya par mégarde la visage avec la chemise qu'elle venait de quitter. Depuis ce moment le prince conçut pour elle la passion la plus violente." Those who are acquainted with the history of France during the sixteenth and seventeenth centuries can well appreciate the magnitude of the social and political mischiefs which derived their origin from this apparently trivial accident.

Case III.—The third case was that of a gentleman from the West of Ireland, who consulted me in February, 1892. He was a strongly-built man, of fifty-two years of age, of florid complexion, and gouty constitution. He had always lived an active country life; he had been married for nineteen years, and had felt hardly any physical or mental ills, except slight attacks of flying gout, till the troublous times of the Land League agitation set in. During this period he had been worried a great deal; he had been continuously boycotted for over two years, and his property had been greatly reduced in value by the consequences of the subsequent legislation. He had then also commenced to drink more than was good for him, and suffered rather severely from gout—two, or sometimes three, paroxysms yearly. It was in the year 1888 that, during the premonitory symptoms of an attack of gout, he noticed that he had suddenly lost the sense of smell. It remained absent for about three weeks, when, as he was recovering from his articular symptoms, the olfactory sensations were almost as suddenly restored. He noticed no further peculiarity connected with the sense of smell till the latter part of 1890, when, with the onset of another attack of gout, the sense of smell was again lost for about seven weeks. It returned more gradually on this occasion; and, for a month or so after its restoration, he was conscious of the presence of a slightly unpleasant odour, which then disappeared. With each of two succeeding attacks of gout he had had a similar experience; the sensation of unpleasant odour lasting longer each time. From the early part of 1891, when he had suffered from a severe and

prolonged gouty paroxysm, the sensation of persistent bad smell had become continuous. It was, of course, very annoying, but as he had had so peculiar an experience connected with the organ of smell, his mind did not seem so much affected by it as in the other cases I had seen. He had sufficient good sense to believe that the symptom was dependent on what he called the "gouty state of his circulation." He had always lived pretty freely; and as he had now entered upon a more contemplative stage of his existence, he was rather disposed to regard any constitutional derangements from which he suffered as a visitation of Providence induced by the excesses of his youth.

Having regard to the history of this case, and the temperament of the patient, I did not think it desirable to try any local treatment; and, accordingly, decided to direct my whole attention to the state of the system. I gave him the usual directions about attention to the bowels, avoidance of excesses in eating and drinking, advised him to rise early, take exercise before breakfast, eschew late hours, &c., &c. I had the bowels freely moved by pretty large doses of colchicum, taken on two successive nights. I then prescribed sodium salicylate in 15 gr. doses to be taken three times a day for a week. As he complained of a tendency to insomnia, I directed him to take four sulphonal tabloids at night. He was greatly pleased with the effects of this drug, and told me that it gave him the most refreshing sleep he had had since he was a young man. The sensation of bad smell, which had hung about him for so long a time, had considerably diminished. As he was returning to the country that evening, I directed him to take a stock of the sulphonal tabloids with him, and to take four every night for a week, also to take a similar dose twice a week for three weeks following. I also prescribed 5 gr. doses of sodium salicylate to be taken three times a day during the same time. I heard from him after a week; he was much better, was in higher spirits, and the olfactory trouble was progressively diminishing. The improvement continued till I heard from him again at the end of another fortnight. I then prescribed a mixture containing 20-minim doses of tinct. belladonnæ and 10-minim doses of tinct. cannab. ind., which he was to use till I heard from him again. When he next wrote, about a month later, the normal sensation of smell was quite restored.

Last November this patient had another attack of gout, brought on by exposure to cold and wet; and the same complication of

smell followed. As soon as he was able to go about, he at once came up to town and placed himself under my care, when a somewhat similar course of treatment was followed by restoration of the normal function.

Case IV.—The fourth case of this kind that I have met with occurred in a member of the legal profession, a gentleman, aged thirty-eight, married, and of highly organised nervous temperament. It had followed a spell of hard work, in which his professional engagements required him to sit up during the greater part of the night for a period of three weeks. He also was of gouty disposition. He was thoroughly used up by this excessive work and want of sleep; and suffered immediately afterwards from intercostal neuralgia and herpes zoster, with a general feeling of nervous exhaustion. After these symptoms had disappeared, he was tormented with vertical headache and sleeplessness, and, while suffering from the latter troubles, he developed the hallucination of bad smell. Soon after the appearance of this symptom he consulted me. He himself thoroughly believed that it was of functional origin. The result was quite satisfactory; for a course of tonics and nerve sedatives, extending over about three weeks, followed by a fortnight's sojourn at Aix-les-Baines, restored him to perfect health again.

Dr. N. Falkiner remarked that it is not surprising if we meet with very alarming symptoms when there is a disorder of the olfactory nerve, considering how largely developed the olfactory bulb is in some animals. Odours sometimes give rise to very marked symptoms. He remembered a case in which a linseed poultice applied to the leg caused repeated attacks of asthma. The drug, nux vomica, which Dr. Knott gave one of his patients, through its alkaloid strychnin, has the power of rendering the senses of sight, hearing, and smell more acute.

Mr. Doyle asked Dr. Knott had the patients been put under an anæsthetic and a systematic and complete examination made of their nasal cavities.

Dr. R. A. Hayes said he had met with some similar cases, and pointed out that treatment should be directed to improve the general state of the patient. In true ozæna the patient himself did not

suffer, because prior to any very offensive odour being developed the nasal mucous membrane is completely destroyed. He did not think it necessary to put patients under an anæsthetic to make a sufficiently complete examination of their nasal cavities.

The CHAIRMAN said he was struck with the fact that all Dr. Knott's patients were males, of different ages and different occupations.

DR. KNOTT briefly replied.

Before treatment

after treatment.

From Photo.

DR WALLACE BEATTY ON MYXŒDEMA.

F Huth, Lith^r Edin^r

A CASE OF MYXŒDEMA SUCCESSFULLY TREATED BY INJECTIONS OF EXTRACT OF SHEEP'S THYROID.

By WALLACE BEATTY, M.D.;

Senior Assistant Physician to the Adelaide Hospital.

[Read in the Section of Medicine, April 14, 1893.]

CASE.—Mrs. M., aged fifty, was admitted into the Adelaide Hospital under my care on March 6th, 1890. She presented the symptoms of myxœdema well marked. Her face had a puffy swollen appearance; her eyelids were swollen; she had a circumscribed blush on both cheeks; the alæ nasi were thickened and the nose was broadened; her lips were thickened; the tongue seemed too large for her mouth and was protruded sluggishly; the mucous membrane of the oral cavity was pale and thickened; she had lost several teeth, and those which remained were loose and carious; her utterance was slow and thick; the thyroid gland could not be felt; there was a marked swelling above the clavicles in the inferior triangle of the neck; the hands were somewhat enlarged; she was clumsy in her movements; the extremities were inclined to be cold; she complained of chilliness and the temperature was subnormal; the bowels were constipated; the abdomen was distended and the skin of the abdomen was thickened; the skin on the front of the chest had a waxy swollen appearance; the skin of the back was shiny, dry, and desquamating, and the skin over many other parts of the body was dry and scaly; the axillæ were destitute of hairs; the heart sounds were feeble and the pulse slow; the urine was pale in colour, of low specific gravity: no albumen or sugar present, and no tube casts; her mental condition was dull and her memory was impaired. Her past history was as follows:—

Except for an attack of rheumatism twenty-four years before she was quite well until the climacteric period four years ago. She then noticed swelling in the abdomen and legs, and subsequently in the face and eyelids. She found by degrees that

her hands were becoming clumsy, and that she had a difficulty in putting on her gloves. She felt a stiffness in the legs when walking. She noticed her mental condition becoming impaired; she felt dull and lacking in memory. Inquiry into her family history revealed nothing of importance.

I am indebted to Mr. Fullerton for keeping a careful record of the case.

During her stay in hospital—from March 6, 1890, to May 23, 1890—I tried the following remedies: arsenic, pilocarpin, iron, and strychnin; also a course of massage for some weeks. She left hospital *in statu quo antea.*

Having succeeded in removing the symptoms of myxœdema in a lady whose case I recorded in the *British Medical Journal* of March 12, 1892, I readmitted Mrs. M. into the Adelaide Hospital in order to try the effect of hypodermic injections of the thyroid gland of the sheep. She was readmitted on February 23, 1892. Her symptoms were much the same as when she was in the Adelaide Hospital before, except that she was much more tottering in her gait, more dull mentally, and she complained of a greater loss of memory; her feet had become larger and more clumsy. The blood was specially examined; I found no increase in the number of white corpuscles; the red were reduced in number, 3,880,000 being the average number per cubic millimetre. Dr. Purser estimated the amount of colouring matter and found it 80 per cent. of the normal; thus, the number of corpuscles and the amount of colouring matter were reduced in about equal proportions, and so the condition of the blood was that of simple anæmia. The knee reflexes were completely absent.

Mr. Swanzy examined her eyes and ears, and reported as follows:—"*Eyes:* The pupils are of medium size; they react sluggishly, and but little to light; the pupillary reaction on accommodation is prompt and sufficient, slight myopia, vision

normal, colour vision normal, fields of vision normal, ophthalmoscopic appearances normal. *Ears:* In each the membrana tympani is normal. *Left ear:* Medium whisper 1–5 metres; watch in contact. *Right ear:* Medium whisper 1–5 metres; watch at one inch from the ear; tuning fork is heard from vertex in each ear, but better in the right ear; this state of functions shows some imperfections of hearing, due, I am of opinion, to defective function or actual disease of the labyrinth in each ear."

I began the injections of thyroid-gland extract on March 4, 1892, and gave the last injection on April 2, 1892. The patient was given, in all, the extract of about two glands.

The improvement which followed the injections was very marked and rapid. The general appearance of the patient improved rapidly, the temperature took a somewhat higher level, the amount of urea—before deficient—increased, the tongue became of natural size, the transverse measurement of its base when protruded its farthest was 5½ centimetres at the commencement of the treatment; after three injections, which were given within six days (and which corresponded to the entire extract of both lobes of one gland), its transverse measurement was 4½ centimetres. The improvement continued steadily, so that for some time before she left the hospital (July 6, 1892) she had quite lost the appearance of myxœdema. Unfortunately, two of my injections, the fourth and the ninth (last), were followed by suppuration. The first abscess healed in a few days after incision by my colleague Mr. Heuston, so that I was able to give the fifth injection fifteen days after the fourth; but the ninth (the last) injection, which was given in the left arm, was followed by phlegmonous erysipelas requiring free incision; after weeks of pain and discharge the arm recovered. I am indebted to Mr. Heuston for his help in the case. I gave the patient a few doses of the thyroid extract

by the mouth before she left the hospital; I cannot say whether it was of benefit, as she had no symptoms of myxœdema when I commenced the administration of the extract by the mouth; I gave it to prevent a relapse.

She left the hospital promising to come and see me once or twice a week, but she never returned, and I have been unable to trace her whereabouts. She dreaded, I think, any further treatment on account of the unfortunate occurrence of the abscesses.

It is interesting to note that after the fourth injection the knee reflexes, before absent, were present in a slight degree, and that the left pupil reacted to light, the right remaining as before. I had an opportunity of examining another case of myxœdema recently; in that case the knee reflexes were present and normal.

Some hours after each injection the patient complained of pain at the site of the injection, once of pain in the head, and several times of aching in the limbs. Very severe left intercostal neuralgia with exquisite tenderness of the nipple of the left breast preceded the formation of the first abscess, which formed within the left scapula at the seat of the injection which caused it. This neuralgia was probably due to the pressure of the abscess on the intercostal nerves behind.

I prepared the extract of the sheep's thyroid in exactly the same way and with the same care as in my first case. The amount of extract which I obtained from the two lobes of one thyroid was from fifty-five to sixty minims.

The extract was made according to the directions given by Dr. Murray, with one or two unimportant modifications. The method adopted was as follows:—The lobes of the thyroid gland of a sheep were removed immediately after it was killed, the instruments used having been rendered aseptic. The surrounding fat and connective tissue were

removed from the lobes. Each lobe was cut up into small pieces on a glass dish, the glass dish having been previously washed with a 1 to 20 solution of carbolic acid. The pieces were put into two sterilised test-tubes, one for each gland, and over them was poured, in sufficient quantity to cover them, a solution containing a ½ per cent. solution of carbolic acid and glycerine in equal part. The test-tubes were left in a cool place for twenty-four hours. The contents were then strained through fine muslin into a glass-stoppered bottle, and the muslin squeezed so as to express as much liquid as possible; the muslin was previously placed for a few minutes in boiling distilled water, and the bottle was also previously disinfected.

It may be of interest to give the subsequent course of my first case of myxœdema—that recorded in the *British Medical Journal* of March 12, 1892.

The lady remained remarkably well from February, 1892, to May without any injection. She then began to feel a return of the symptoms—viz., slight mental dulness, and some return of swelling of the eyelids. These symptoms disappeared at once after a few injections. She remained well for two months, when, owing to a threatened return of the symptoms of myxœdema, she was given in the end of July and beginning of August a few injections which were followed immediately, as before, by disappearance of the symptoms.

Some of the injections (given after the writing of my paper) were followed by alarming symptoms. A short epileptiform attack followed one injection; severe, indeed agonising, pain in the lumbar region followed two injections; this pain lasted only about two minutes. After another of the injections a weak feeling came on immediately, followed by agonising lumbar pain and rapid swelling of the upper lip, face, and eyelids; the swelling was very obvious within five

minutes after the injection, and made the patient look markedly myxœdematous; the puffiness of the face subsided gradually in the course of about two days.

In the middle of August she went to the country for change. When I saw her next in October she was quite free from the symptoms of myxœdema, but complained of pain and swelling in her abdomen. I was distressed to find, on examination, a malignant tumour of the omentum. She died on February 28, 1893. The tumour had grown with extreme rapidity and caused her death.

Dr. J. K. Barton sent me an account of a case of myxœdema which has been recently under his care at Mentone. It was that of a lady, aged fifty-eight, who dated her earliest symptoms to a great sorrow three years previously. When she came under Dr. Barton's care in January, 1893, she presented all the symptoms of myxœdema. Dr. Barton gave her injections of the extract of sheep's thyroid gland. These injections were followed by a marked improvement in the lady's condition.

A FATAL CASE OF BLOOD-POISONING AFTER EXTRACTION OF A MOLAR TOOTH.

By JOHN J. BURGESS, F.R.C.S.;

Late Assistant Surgeon to the Richmond Hospital.

[Read before the Section of Medicine, April 14, 1893.]

ALTHOUGH the results of minor operations are so unvarying in their tendency to a favourable issue that we may predict with as much certainty as is possible for their future an entire absence of danger, yet cases, very few I am happy to say, occur now and then in practice in which the order of things is reversed, which, from insignificance, as far as peril to life is concerned at their onset, develop an extreme malignancy, and sometimes destroy life in individuals whose constitutions have hitherto been robust.

I deem it a duty to record a case of the latter class; its interest lies in this fact, that the pyæmic symptoms arose from what is a most exceptional cause, and its history brings to our minds that however trivial the injury be, if attended with an open wound, there is an element of danger which we should not lose sight of.

Hundreds of teeth are extracted every day, some with every accessory of modern dental skill to diminish the slightest risk; others by our residents in the various hospitals, when very often muscular power replaces science, yet the result is nearly always the same—a few days tenderness and swelling of the gums, a slightly fœtid discharge for a week, and nothing remains except, perhaps, a feeling of gratitude to the operator. However, to show this rule has an exception,

I shall claim your attention for a few minutes with the record of the following case:—

CASE.—On the 3rd November, 1885, a gentleman, aged twenty-seven, clerk in the Port and Docks Board, consulted me after suffering from what he supposed to be neuralgia from a decayed tooth. He had had the second molar tooth of the left lower jaw removed three days previously; there was no abscess at the fangs; the extraction was without difficulty; and temporary relief was experienced. At the time he suffered from great pain, which came on one day after the removal of the tooth; the seat of the pain was around the site of the extraction. The gum was swollen and brawny in the situation of the three lower back teeth on the affected side, with hardness outside corresponding. I advised him to go home and use hot fomentations, and called to see him the following day (4th Nov.). He was then in great pain, the swelling of his gum had increased, with the usual discharge of glairy mucus. I freely incised the swelling both on the surface and deeply, with the result that there was free bleeding, but no pus. Two days afterwards (6th Nov.), when I next saw him, there was no abatement of the pain, and the swelling had spread to the submaxillary space. There was no feeling of fluctuation anywhere, so giving him opium to relieve the pain, I bid his wife continue the hot stupes.

The next day (7th Nov.) it was evident he had developed cellulitis on the left side, as the brawny swelling had extended forwards, indurating the fascia over the triangles of the neck. He would not consent to any incision being made except through his mouth, so having no other means of giving relief I drove a bistoury through the gum, along the maxillary ramus, into the tissues of the neck, avoiding, as well as I could, the facial artery. The bleeding was, at the time, rather alarming, but, as before, no relief was given. The cellulitis spread over the left side of the neck, with a moderate temperature, never exceeding 103° F.

As no surgical interference of the ordinary kind was permitted, and, as incisions through the mouth gave great suffering but no relief, I had to satisfy myself with the ordinary sedative treatment, giving him as much nourishment as he would take. On the eighth day, before I saw him, he had a feeling as if "of being choked, followed by something giving way in his throat," after which he coughed up a quantity of pus; this gave him great relief, insomuch

that when I saw him in the afternoon (15th Nov.) he stated that he felt nearly well. The cervical induration rapidly disappeared; his appetite and spirits returned, and, except for looking rather pale, he was nothing the worse for what he had gone through.

By my advice he was going to spend a few weeks with his parents near Dalkey, when, on the eve of his departure, about a week after the subsidence of the acute symptoms, I was sent for by telegram to see him before he undertook the change to the country. He had been perfectly well for the above time, but awakened that morning with a feeling of intense soreness of the throat. On examination he presented the common diffuse sore throat, with injection of the soft palate and tonsils, without marked enlargement of the latter. Accordingly I bid him stay where he was for a few days, and prescribed an astringent gargle.

On the following day I was rather surprised to find he had developed commencing facial erysipelas (18th Nov.). This, of course, negatived all thoughts of his removal. The facial erysipelas, as usual, continued for five days; without implicating the scalp it was very severe, and accompanied by what I find unusual, an almost continuous temperature of 105°. When the erysipelas declined, on the 22nd Nov., I was rather astonished to find the temperature had not decreased in any marked way, being still 103°.

The following day (23rd Nov.) it was still the same, with a rapid pulse; he complained of nothing except weakness, so failing to find any other cause for the symptoms I then did what I neglected before, on account of nothing pointing that way—made an examination of his throat—and then, to my consternation, found it covered with a dry, whitish, yellow membrane, lying on the pharynx, base of tongue, soft palate, and tonsils. There was no cervical glandular enlargement, nor albuminuria; except for what I have before alluded to—the feeling of prostration—he was able to take nourishment well; his intellect was clear, and, considering his condition, he was rather cheerful.

As in my mind, at the time, there was no mistaking the then gravity of the case, I asked his people for the assistance of some other medical man, and, at their wish, my friend, Dr. Michael Boyd, joined me, and gave me his valuable assistance each day. We attended to his strength, by giving him eggs, milk, &c., keeping his throat sprayed with sulphurous acid, and the room well ventilated, at the same time cleaning twice daily the membrane from

the palate and pharynx. There was at no time any glandular enlargement, nor albumen in his urine, but what appeared like membrane was seen at the anus.

On the ninth day (1st Dec.) the membrane began to show spots of healthy mucous tissue, and in the following days disappeared into bands which hung from the palate. About this time, when everything seemed to be going on well, the temperature keeping low in the day time, and going up to 102° at night, he had some rigors; these at first were followed by no symptoms of further mischief, but just when the throat had cleared we noticed there was hardness along the internal saphena vein in the left leg. This complication gave him some pain, and made him restless. However, the acute symptoms disappeared by the aid of hot poultices in a few days, although the vein still continued hard. We then thought there was an end to our labour, when we found the membrane had come back to its old position, and covered the palate and pharynx as previously it had done a fortnight ago. The temperature took the same range, 103°, with a half degree higher at night. The pulse averaged 120, rather weak. The membrane after a few days began again to peel off, but the temperature and pulse remained unchanged; rigors now became more frequent, generally two in the day, without sweating.

At this period there appeared spots of redness, which were immediately followed by collections of pus; these we at once aspirated, one at right shoulder; a second at the right forearm; a third corresponding to the tuberosity of the right ischium; a fourth above the left knee; and last one on the left leg, corresponding to the site of the previous phlebitis. After this there was a sudden amelioration of all the symptoms; the rigors ceased; the pulse slowed down; the temperature was normal, except at night, when it ascended to 100°; the appetite had increased, and, in short, everything seemed to point to a rapid recovery, when, suddenly, we were again called to see the patient, about four days after giving up attendance, and found him in wild delirium, from which he sunk into deep coma, with Cheyne-Stokes' respiration. He died the following day from what was evidently secondary abscess at the base of the brain.

It is a curious fact that on looking over the literature bearing on this subject, of three fatal cases of a similar nature after the removal of a tooth it was the same

tooth as in mine (the second left lower molar) which was extracted.

M. Bouyon, in the *Courier Médical*, 1873, mentioned the case which came under his notice of a countryman who had this tooth removed by a blacksmith. The man developed periostitis, and died of septic infection in a very short time.

Zahharvich had two cases of perfectly healthy medical men from whom this tooth was removed, both of whom died from ostitis and osteomyelitis, one on the sixth, the other on the tenth day.

Goodhart, of Guy's Hospital, records a case of fatal pyæmia from a non-extracted tooth, the abscess involving the inferior dental canal; the pus passing thence to the articulation filled the sphero-maxillary fossa, and was followed by intracranial suppuration.

In addition to these, and bearing on the subject, is the case of Mr. Baker, of our city, whose patient developed pyæmia from abscess in an upper molar tooth which was not extracted, followed by secondary abscesses over the body, but which he succeeded in bringing to a favourable termination.[a]

M. Foucet, at the Surgical Society of Paris, 1886, brought forward a case of an alcoholic who died of pyæmia following a hard swelling at the angle of the jaw due to a bad tooth.

I do not propose to dwell on the treatment more than to say I believe the impossibility of making incisions in the cellulitis stage beyond prolonging it for a few days did no harm, as he was a week free from suffering—*i.e.*, from the

[a] With the assistance of Mr. Baker, to whom I am deeply indebted for the assistance he gave me in writing this paper, we found recorded thirteen cases of a fatal termination—ten in addition to the above. Of the latter, one died of tetanus, one of hæmorrhage, six of meningitis from pyæmia, and two to exhaustion from blood-poisoning without cerebral symptoms. The record of these cases is very interesting, and is to be found in Professor Müller's (Berlin) book.

bursting of the abscess into the œsophagus until the invasion of the erysipelas.

The treatment of the erysipelas deserves no mention except as regards the high temperature of 105°. For this no antipyretics were used, because from my experience no drug has any power more than, I may say, momentary to keep down an essential temperature; and the one thing which I believe does good—the cold bath—was not tried for obvious reasons.

In the membranous stage the usual course was adopted, giving internally plenty of stimulants.

I may add, the fatal issue was not precipitated by movement, as the patient was allowed merely to be lifted out of bed into an easy chair when considered convalescent.

I now come to what is a subject of greater interest—the membranous exudation which came on in this case when matters began to look bad for the first time.

I purposely refrain from using the word diphtheritic, for reasons I will explain.

Both before this case and on many an occasion since, I have seen this same condition of throat varying in intensity—in milder cases from an exudation like clotted milk, which readily peels off, leaving an unabraided surface, to a condition in which the membrane (of a yellowish white colour, resembling in its consistence parchment) can only be detached with difficulty, leaving a bleeding surface at its site. In the former class of cases the tongue is generally moist, in the latter always dry and attended by profound adynamia. In neither is there albuminuria nor glandular enlargement about the neck.

This is a state of affairs which I find many men call by the misleading name of diphtheritic throat, having no analogy to true diphtheria, but in the fatality which attends too many cases in which it is a symptom due, not to the per-

nicious influence of a spreading membrane, but to some antecedent cause still in progress, of which it is merely a symptom. It has these characters which distinguish it from the disease of Bretonneau:—

1. It is non-contagious.
2. It has no tendency to laryngeal or nasal implication.
3. It is always secondary, requiring for its development some acute disease, such as enteric fever or erysipelas.

From my own experience I believe a period comes on in protracted acute disease, whether it be pneumonia, pleuritis, or fever, when we may look for the sign which is a danger signal beginning to develop in the soft palate and pharynx; and its significance seems to me to point to this—the patient's strength, which has withstood the shock up to the present, is now rapidly failing, and, unless supported by a stimulant line of treatment, an unfavourable termination is imminent.

I am aware this throat is well known to us all, but I simply wish to draw attention to it, because we so often hear of the diphtheritic affections. Now, diphtheria, I am happy to say, if we exclude croup, which has very little in common with it, is a disease we do not see much of. Sporadic cases are mentioned from time to time which may occur to several individuals in a badly-drained house and be very fatal, but which are non-communicable to outsiders visiting them, differing in this—absence of contagion, and with extension of the disease to the nasal fossæ or larynx from the true disease, and bearing a greater analogy to malignant typhoid than to diphtheria.

I consider the word diphtheria or diphtheritic, which I presume means the same, except in its pathological sense, to be used too indiscriminately for the ordinary sore throat so common to numbers of people in the spring, due to the secondary remote effects of a blood poison, and I believe that the

disease diphtherite, as described by Storr, Bretonneau, Trousseau, and Empis, does not exist in our city, but, like several epidemics of ages gone by, it has succumbed to the advance of modern hygienic science. I am conscious many will say that cases such as I have described are totally distinct from true diphtherite as to the membrane; but, excluding the aphthous throat of late phthisis, I submit the membrane in the above is identical in appearance, and an observer like Solas Cohn practically includes them in his description of diphtheria when he says — "Membranous throats are often followed by paralysis similar to the true disease, and fatal by membranous laryngitis."

Let me not be misunderstood as denying the existence of diphtheria. My object simply has been to draw attention to cases, for a scientific motive, which too often get the above name, without any further claim than a membrane existing on the palate, to a disease which has ravaged Europe in past times.

It may be suggested that an easy solution to the difficulty of diagnosis would be the discovery or not of the Klebs-Löffler bacillus by microscopic examination of the membrane. Even if it were definitely fixed that this organism was the cause of diphtheria, there still remains the possibility that its existence in the air we breathe might determine its presence in any throat, like the case mentioned by Oertel in which he found these microbes in abundance on a membranous throat, due to the irritation of strong ammonia. Again, we have the statement of Lennox Brown that they are frequently found on perfectly healthy throats before their destruction by the scavenging action of the white corpuscles. Under these circumstances its discovery would be in no way conclusive, so I eliminated it as a means of determining the difference from a specific and a non-specific cause.

In conclusion, I confess this paper has been written with a certain amount of reluctance, as I know it is more usual, I am happy to say, to record before the Section our successes than our failures; but I submit, even from a description of this disastrous case, there are many things to be learned, the least of which perhaps is not to underrate the future gravity of a case as I did in this instance from an apparently unimportant beginning.

Dr. Arthur Bakke said he could remember similar consequences following a difficult extraction, and also one in which no difficulty was met, though the cases are of extreme rarity. It is very difficult to give relief. An incision seldom gives vent to any amount of pus. The socket is generally filled with dark-coloured slough, and by clearing it out, syringing, and then insufflating some iodoform, and finally putting in a plug of wool, relief is obtained.

Dr. Little said that some years ago he saw a young man who was feverish and ill some ten days after the extraction of an upper molar. Up to the removal of the tooth he was, in his own opinion and in that of his uncle, in perfect health. Gradually active lung mischief developed, and he shortly died with all the symptoms and physical signs of acute phthisis.

Sir William Stokes said he was reminded of the case of the late Dr. Thomas Beatty, who suffered from acute pain in his teeth, and persuaded a dentist against his better judgment to withdraw one of the teeth. Pyæmia rapidly set in, and he died in a few days. He probably suffered from some gouty osteitis.

Dr. J. Marshall Day said that he had met a case of an old woman, one of whose teeth was extracted, and who in three days returned to the hospital with tetanic symptoms. She had trismus, and recovery was tedious.

Mr. Burgess, in reply, said that his patient for about a month previous to the extraction of his tooth was in a low condition of health. The symptoms became acute just after the extraction of the tooth.

ON THE DIAGNOSTIC VALUE OF THE DIAZO REACTION.

By W. R. DAWSON, B.A., M.D. Univ. Dubl.;

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[Read in the Section of Medicine, May 19, 1883.]

The daily-increasing demand for greater precision in diagnosis—a demand which is evidenced in one direction by the ever-diminishing number of cases of that somewhat unsatisfactory entity, febricula, as shown by certain returns—ensures a welcome for any means by which we can arrive at an additional fact to aid in deciding on the exact nature of obscure cases, particularly if the fact be of an objective nature. The most skilful diagnostician would often be glad of an infallible pathognomonic, could such be discovered, to which he might appeal in a doubtful case, for example, of that most protean of acute diseases, enteric fever, which in its atypical forms may simulate even such commonly quite unlike ailments as pneumonia and measles, not to mention tubercular meningitis, typhus, and acute miliary tuberculosis, and that so closely as to render the diagnosis extremely puzzling.

A consideration of the peculiar nature and composition of the urine, of the great variability of its constituents even in health, much more in disease, and of its function of conveying noxious substances from the organism, might lead one to expect that many diseases would give unmistakable evidence of their presence by the appearance of some distinctive substance in that excretion, and this

would be especially probable with diseases of microbic origin, since, although the intracellular poisons of different micro-organisms may produce similar results, as recently shown by Klein, yet the toxins formed by them externally are different for every disease. Such unmistakable data, we may hope, will yet be forthcoming when more is known of the many obscure and complex urinary bodies which are still so little understood; but in the case of two diseases, at least, some important steps have already been made in this direction.

In the year 1882 there appeared in the *Zeitschrift für klinische Medizin* an article by Professor Ehrlich containing an account of a new urinary test. Observations on the coloured bodies which diazo combinations, made by the action of nitrous acid on amido compounds of the aromatic series, form with various substances, especially certain phenols and primary, secondary, and tertiary mono- and di- amines of the same series, had led him to surmise that such reactions might be obtained in the secretions and excretions of the human body, especially in the urine, and might, if present, possess some practical significance. Experiment also showed that should the body combining with the test-substance (diazobenzol) be alkaline, the reaction would only take place in a basic medium; if acid, in an alkaline. Ehrlich accordingly tested the urine of a great number of patients in this way, with the result that his expectations appeared to be completely realised.

The crystalline diazo bodies themselves being difficult to procure, he preferred to use for testing solutions in which they had been formed under the influence of mineral acids and nitrites, and such solutions have been ever since employed, although with slight modifications. A saturated solution of sulphanilic acid in strongly acidulated water is first made; for acidulating Ehrlich originally used nitric

acid, but hydrochloric is now more commonly employed, the proportion in the formulæ from which my test solutions were prepared being 1 in 8. To this acid solution is added, just before use, a few drops, about 5 minims to the ounce, of a very dilute solution of sodium nitrite (1 in 200). The changes which thereupon take place may be expressed empirically thus:—

(1) $$NaNO_2 + HCl = HNO_2 + NaCl.$$

(2) $$\underset{\text{Sulphanilic acid}}{C_6H_4NH_2 \cdot HSO_3} + HNO_2 = \underset{\text{Diazobenzolsulphonic acid}}{C_6H_4N_2 \cdot SO_3} + 2H_2O,$$

and the resulting fluid contains small quantities of sulphodiazobenzol (diazobenzolsulphonic acid), to which the reaction is due, together with some excess of sulphanilic and hydrochloric acids, which are indifferent or beneficial. The advantage of this method of preparing the solution is that great accuracy in weighing and measuring is unnecessary.

The mode of applying the test, and the appearances when a typical reaction results, are as follows:—A test-tube is filled to about one-third of its height with urine and an equal quantity of the test solution is added. The resulting fluid may assume a yellow colour, which constitutes the *first part* of the reaction, but this does not invariably occur by any means. If now, however, some liquor ammoniæ or liquor potassæ be added, a more or less deep blood or port-wine colour at once appears, and the foam formed on shaking the tube is deeply tinged. This constitutes the *second* and really significant part of the reaction. The *third* and last part consists in the separation of a greenish-black or violet-black precipitate, which forms a layer on the surface of the light-coloured sediment when the tube has been allowed to stand for 24 hours.

Urine which does not show the reaction assumes some shade of yellow or orange on adding the alkali, and on

standing throws down a precipitate which is of no particular colour.

More recently Ehrlich has modified the mode of application, by mixing the urine first with five or six times its volume of absolute alcohol, and then adding the reagent drop by drop.

Having tried the test with a great number of different diseases, Ehrlich came to the conclusion that, with the exception of phthisis, the morbid conditions in which the reaction is obtained are always of a febrile nature, and these he divided into three groups:—

1. Diseases in which the reaction is constant, as enteric fever and measles.

2. Diseases in which it occurs with greater or less frequency according to the nature of the attack, as erysipelas, miliary tuberculosis, septicopyæmia, pleurisy, scarlatina, intermittent fever, &c.

3. Diseases in which it is scarcely ever seen, as pneumonia and diphtheria.

The three diseases in which it was found constantly in a great number of cases are *enteric fever*, in which Ehrlich failed to obtain it in only two out of many cases, one of the two being a very mild attack; *measles*, in which it was never missed; and *phthisis*, in which it occurs constantly in the acute form, and also, though with long periods of intermission, in the chronic. In enteric fever it was found in many cases all through the course of the attack, and one or two days over the time of subsidence of the fever, in others it disappeared at the beginning of the remissions, or more rarely from three to five days before, whilst very seldom, and that usually in the lightest cases, it was found merely in the first three or four days of observation. In measles it invariably appeared at the commencement of desquamation—*i.e.*, about the crisis—and

usually, though not invariably, during the eruptive stage. In acute phthisis it was, as a rule, markedly present during the whole course of the disease; in chronic phthisis it was present during periods of varying duration separated sometimes by long intervals, and this was the only disease in which it was found absolutely unconnected with febrile processes.

From these and similar data Ehrlich drew the following conclusions, amongst others:—

1. The reaction is one of the most constant symptoms of enteric fever from the middle of the first week on, so that its absence renders the diagnosis doubtful.

2. The reaction cannot be used for the diagnosis of enteric fever from diseases of the second group.

3. The occurrence of the reaction in croupous pneumonia indicates the supervention of complications.

4. The presence of the reaction for a length of time and in the absence of fever points to phthisis.

These conclusions are of sufficient importance amply to warrant the great interest which was excited, notwithstanding the fact that one of them expressly deprecates the use of the reaction in diagnosticating between enteric fever and such diseases as miliary tuberculosis, septicopyæmia, intermittent fever, &c., in which difficulties most frequently arise. Numbers of independent investigations followed (von Jaksch mentions no less than seventeen names altogether), with the usual result, that a difference of opinion has arisen as to the value of the reaction, some supporting Ehrlich's original view, while others go so far as to deny it any diagnostic significance whatever. One of the most important of the latter school, both on account of his large material and of the study he has given to the chemistry of disease, is Professor von Jaksch of Prague, and he speaks with no uncertain sound:—'From my own very numerous trials of

the test," he says in the last edition of his work on Clinical Diagnosis, "I am obliged to deny that this reaction has any clinical significance, and I must above all warn my readers against seeking to draw any practical conclusions from its positive presence." In his opinion, it is simply an imperfect test for acetone, the presence of which explains its occurrence. Von Jaksch's successor in Professor Nothnagel's Klinik at Vienna, Dr. Lorenz, is inclined to ascribe to it a certain amount of value; but in the Charité Hospital at Berlin it is generally regarded, I am informed, as a somewhat indiscriminate accompaniment of febrile conditions. Others have found it, however, in non-febrile affections also, and it may be said that upon the whole the result of research has been to lessen the estimation in which the test is to be held.

Some years ago I made, by Prof. Purser's desire, careful observations on a small number of cases at Sir Patrick Dun's Hospital, the diseases selected being chiefly those of Ehrlich's first and second groups. The record is, unfortunately, not at hand, but a short general summary of the results ran as follows:—"I found that typhoid urine usually gave it" (*i.e.*, the reaction) "but not invariably, as it was absent in several well-marked cases. Measles almost invariably gave it, but apparently only during the height of the disease. I found it in phthisis, but never could obtain it" in a certain very advanced case in which the tuberculosis had become somewhat generalised. "Finally, the reaction was markedly given by the urine of a typhus patient, but this is the only instance in which I ever found it in any but the three diseases in which it is supposed to occur." The number of cases was, however, too small, and their character too restricted to render the results of much value; but it will be seen that so far as they go they tend to show that the presence of the reaction is not so constant in enteric fever

strengths up to 50 per cent., and also with a solution in urine, and in no instance did any of them show more than a yellowish orange colour, many shades removed from the lightest red that could be admitted as positive; and further, the depth of the tint was in all cases about the same whatever the strength of the acetone solution. Its presence in urine which yields the diazo reaction would therefore seem to be a mere coincidence—at least the red colour cannot be due to free acetone.

Before proceeding to give the results of my observations, however, it is right to state that absolute certainty cannot be claimed for them, as lack of time and other causes rendered it difficult or impossible to exclude all sources of error. Thus the tests were carried out in all kinds of light and at all hours as occasion served, and it was occasionally impossible to examine the urine for a day or two after it had been passed, delays which were the more serious, as febrile urine decomposes much more rapidly than normal, so that now and then it was quite turbid and did not clear on filtration. In order to try whether decomposition affected the diazo reaction, two urines in which the latter was present were allowed to stand in a moderately warm room for a fortnight. On retesting, one of them only gave an orange colour, but in the other the diazo reaction was again obtained. This test was, of course, a very severe one, as, it need hardly be said, the first-named sample was enormously more decomposed than any entered on the record; and, generally speaking, the colour appeared to have no relation to the age of the urine (this is also true of the indican reaction); moreover, the intervals between collection and testing have been noted, and the average found to be from one day to the next—probably very much under 24 hours. Lastly, the diagnoses assigned were merely those which seemed most probable at the time, and it was in the majority of cases impossible to

verify them absolutely afterwards, even when death took place in the hospital. It is, therefore, as rough results only that the following are to be regarded.

The number of cases from which the statistics were compiled is 227, or, since many were examined more than once, some 297 sets of testings in all. In a certain percentage of these, however (which was noted), all the tests were not applied. The varieties of disease thus dealt with were 47 in number, and were as follow:—Enteric fever, 85 cases, including two in which typhus was simultaneously present, and one complicated by pneumonia; influenza, pneumonia, of each 20 cases; typhus, 10 cases; German measles, 8; bronchitis, 7, one of which was complicated with icterus; acute rheumatism, 7; scarlatina, 7; erysipelas, 5; febricula, 4; chronic phthisis, 4, phthisis complicated by bronchitis and by pneumonia, of each 1, and 1 case of subacute phthisis; whooping-cough, 4; constipation, 4; measles, 3; tonsillitis, 3; varicella, 2; and 1 case of each of the following:—Alcoholism with hepatic cirrhosis, broncho-pneumonia, cancer, cholera nostras, delirium tremens, obscure hepatic pain, icterus, laryngismus, leucorrhœa, lumbago, lumbago and sciatica, mastoiditis, meningitis simplex, meningitis tubercularis, mitral disease, neuralgia, pelvic inflammation, pleurisy, purpura, chronic rheumatism, septicæmia, stomatitis, and uræmia. There were also three or four practically normal cases, which have been retained for control purposes, and none of which gave a positive result when tested.

In 15 only of the above 47 varieties of disease was the diazo reaction at any time obtained, but these comprehended 167 of the 227 cases, leaving it questionable whether examination of a larger number of cases would not have shown it in some of the others also. The diseases in which it was present were alcoholism and cirrhosis, bronchitis, enteric fever, enteric + typhus, and + pneumonia, influenza, measles,

meningitis tubercularis, acute phthisis, pneumonia, acute rheumatism, scarlatina, typhus, and whooping-cough. With regard to the case of alcoholic cirrhosis—a diseased condition in which Ehrlich failed to find the reaction—it should be explained that at the time the patient was in hospital she was suffering from a febrile attack, the nature of which was not very clear, except that it was almost certainly not enteric. The case of acute phthisis was really only subacute, and that of tubercular meningitis is open to question from those who deny that this disease ever recovers. It will be observed from the above that all the diseases showing the reaction were of a febrile character to a greater or less extent, which tallies with Ehrlich's observation; but the height of the temperature *per se* appeared to have little or no connection with the presence or absence of the reaction. Of the diseases in which the reaction did not occur, it may be mentioned that they included some belonging to Ehrlich's second group—*i.e.*, diseases which he found often give it, viz.—erysipelas, pleurisy, and septicæmia, but the number of cases was, of course, very small—five, one, and one respectively; and in four cases of chronic phthisis, and one each of phthisis + bronchitis and phthisis + pneumonia, one of the periods of intermission of which he speaks seems always to have been happened on. Lastly, a point which may prove of some diagnostic import, the results were absolutely negative with the eight cases of German measles examined.

Turning now to the proportion of cases in which the reaction occurred in each disease, and taking those of which more than one case was examined, the following is the result:—Enteric fever, 82 cases, 42 times; enteric + typhus, 2 cases, once; enteric + pneumonia, one case, once; total, 44 times in 85 cases of enteric fever, or a little under 52 per cent. It should be remarked that true relapses have been treated as distinct cases, and of these there were four

included in the numbers just mentioned. None of them ever showed the reaction. Ten cases of typhus gave the reaction 5 times, and it was present in 3 out of 7 cases of scarlatina, 2 out of 3 of measles, 2 out of 4 of whooping-cough, and once in each of the following:—Influenza, 20 cases; pneumonia, 20; bronchitis, 7; and acute rheumatism, 7. Its presence in the single cases of cirrhosis, tubercular meningitis, and subacute phthisis has already been noted.

These figures seem at first sight to present some very striking differences from those given by Ehrlich. Tubercular meningitis, indeed, and acute phthisis gave the reaction as they ought, so far as can be judged from single cases; scarlatina showed it in about the right proportion for a disease of the second group, and in pneumonia, and the rest of the respiratory diseases, it appeared with a sufficient degree of rarity; but in measles it was absent once in three cases, and in enteric, as we have said, it was only found in about 52 per cent. of the cases, while of the testings, 131 in number, it was present only in 53, or about 40 per cent., so that it was found in this disease in an actually smaller proportion of cases than in typhus, in which it occurred in 5 testings out of 11, though of course the disparity in the numbers of cases renders any real comparison impossible. It is highly probable, it may be remarked in passing, that Ehrlich had had no opportunity of testing the urine of typhus (which he does not mention in his original paper), that disease being of extreme rarity in Berlin.

The divergence alluded to is, however, more apparent than real. Ehrlich was able to test the urine of each of his cases many times, so that it is necessary to know also the period of the disease at which my tests were made if the two sets of results are to be compared. It may be said at once that of the cases of enteric which were tested more than a single time, and within the first three weeks, excepting relapses,

only one undoubted case (and that an unusually mild one) failed to give the reaction, while it almost invariably disappeared at the end of the third week. The single tests show similar results. Thus taking the total testings, with the exception of 24, the date of which it was impossible to fix, and only 5 of which gave the reaction, we find that in two tests in the first four days of the attack it was not obtained at all; in 13 from the fifth to the seventh day it was found 7 times; in 40 in the second week, 29 times; in 15 in the third week, 12 times; once out of 18 in the fourth week; twice out of 9 times in the fifth, and never afterwards. Thus it was present in 47 out of 67 tests between the fifth and the twenty-first day—*i.e.*, over 70 per cent.—and some of the cases which did not give it were doubtful. One of those in which it occurred in the fifth week was very protracted, the temperature not having fallen permanently until the sixtieth day. The periods at which the reaction was found in the other diseases may be more briefly dealt with. Excluding, as before, cases in which the date could not be fixed, we find that it was present in the alcoholic case at the beginning of the second week, as also in that of bronchitis and that of broncho-pneumonia. In influenza it was present at the end of the first week, in measles on the fourth and fifth days, while it was once missed on the third, but in this case it might have been found later had the test been re-applied after crisis. In meningitis it appeared at the beginning of the third week, in scarlatina on the tenth, eleventh, and eighteenth days—the last in a case which was very protracted, and followed by suppuration of glands, &c. In typhus the dates could not be very accurately determined, and in one of the cases showing it the diagnosis is doubtful. The case of subacute phthisis had been several months ill.

Thus the figures correspond much more closely with those of Ehrlich than would at first appear, but making all due

allowances and deductions, it is clear that the reaction is less valuable as a diagnostic, in enteric fever at least, than he supposed. In the first place, its occurrence in the first three weeks of the attack is by no means constant; it is probably absent in at least 20 per cent. of the tests, while prior to the latter part of the first week its presence seems to be quite exceptional. Secondly, it is present in at least a considerable proportion of cases of typhus, and also occurs very frequently in different kinds of tuberculosis, so that it cannot be used in distinguishing from these diseases; nor is it available to diagnosticate a morbilliform rash, such as occurs at times in enteric fever, from that of true measles; and thirdly, its occasional though less frequent occurrence in such diseases as pneumonia and diphtheria, to say nothing of influenza, reduces its worth still further. It is, however, undoubtedly more frequent from the fifth to the twenty-first day in enteric than in any of the other diseases except measles, or perhaps tuberculosis, so that if the time be taken into account, and these two diseases be excluded, it does certainly increase the probability, *ceteris paribus*, that the case in which it is present is one of enteric fever, while its absence speaks in a still greater degree against such a diagnosis. With measles, however, the case is different. The reaction here is almost invariable, and from what I have observed not only at Cork-street, but in the former investigation to which allusion has been made, I believe it will be found, with few or no exceptions, at one or other period of all attacks. In the previous investigation several cases were tested all through, and the reaction was found to cease about the time of crisis; but we have seen also that it may not begin until then (Ehrlich), though my observations seem to show that this is rarer. Now it is not often that any difficulty can arise in diagnosticating measles from scarlatina, in a considerable proportion of cases of which the reaction is

found; but Rôtheln in the early stages is often almost impossible to distinguish, and here the reaction may be of use should its absence from every case of the latter disease prove as invariable as I found it in the 8 cases tested, which were examined, 2 on the third, and 3 each on the fourth and fifth, days of the attack. The facts are at least so suggestive that it would be worth while to accumulate a little further evidence.

With regard to the concurrent presence of other abnormalities, since this does not, strictly speaking, come within the scope of the present paper, it need only be said that the presence of the substance to which the reaction is due does not appear to have any connection with the colour, deposit, odour, or reaction of the urine. The average specific gravity was somewhat higher in the cases in which the diazo reaction was found, and a rather larger proportion of those cases showed the presence of albumin and indican, the latter of which was observed in about 40 per cent. of the enteric fever testings to a degree that could be considered abnormal, whereas its proportion in all cases of the 16 diseases in which the diazo reaction was also present was 30 per cent. Sugar was only found six times, or in three cases, all of enteric fever, and it coincided five times with the diazo reaction. One of the three patients whose urine showed it was a lactating woman. The preponderance of the number of testings in which the diazo reaction concurred with any of the above, was not sufficient to justify any conclusion, not being greater than can be explained by the severer character usual in cases which show the reaction.

Finally, the substance causing it does not seem to be any direct product of the typhoid bacillus. Wishing to try this, I inoculated a tube of sterilised bouillon from a typical culture, and allowed it to stand for four days at the temperature of the room. The bouillon was then quite turbid,

and having examined it microscopically for the presence of the bacillus, I applied the diazo test, but found that although the colour changed, it grew no deeper than orange-yellow. A portion scraped from the surface of a very old culture on agar and tested under the microscope, also failed to give any marked response. The same results, except that the colour was, perhaps, a shade lighter, were obtained with cultures of *Bacterium coli*. It is possible, however, although unlikely, that four days' growth is not sufficient, and I hope later on to repeat the experiment with older cultures and growths on other media.*

The conclusions, then, which seem to be warranted by this investigation are briefly these:—

1. That the diazo reaction is found in the great majority of cases of enteric fever at some period between the fifth and twenty-first days, and is more constant in that disease than in any other (of those tested) except measles, and, perhaps, acute phthisis, so that, with these reservations, its presence affords a presumption in favour of, its absence a much stronger presumption against, such a diagnosis.

2. That the reaction cannot be used either positively or negatively to distinguish enteric fever from phthisis or measles, and that the presumption which it affords against typhus is small.

3. That it is nearly or quite constant in measles, but absent in at least many cases of Rötheln, and may, consequently, be used in distinguishing between them.

4. That the substance causing it does not indicate its presence by any peculiarity in the colour, odour, deposit, reaction, or specific gravity of the urine, nor by the presence

* Portions of the bouillon cultures used were retained and tested some weeks later with the same results, and six days old growths in sterile urine also gave a yellowish-orange colour in the case of both bacteria. The colour of the bouillon cultures was, if anything, lighter than before.

of albumin, sugar, or indican, although their concurrence is not uncommon.

5. That it is not due to free acetone, nor to a direct product of the *Bacillus typhosus* of Eberth.

It only remains for me to express my regret that lack of time and facilities prevented the attainment of a higher degree of accuracy in the research, and, consequently, of certainty in the conclusions.

DR. J. W. MOORE stated that, in the autumn of 1891, through the kindness of Dr. Reynolds, he had made a series of experiments with this reaction. He brought down five specimens of urine to Dr. Reynolds' laboratory, and Dr. Reynolds himself performed the tests. Specimens Nos. 1 and 2 were from patients suffering from typhoid fever, No. 3 from a case in which the diagnosis of typhoid at the time was doubtful, and Nos. 4 and 5 were from patients who had not typhoid at all. Nos. 1, 2, and 3 gave the reaction, Nos. 4 and 5 did not. In Case No. 3 the reaction was incomplete, the case being one of recurrent typhoid fever after a lapse of 14½ years. Since then he learned not to place too much confidence in the test, although he regarded it as a valuable aid in the diagnosis of typhoid fever.

DR. PURSER said that the test occupied a curious position among urinary tests, because it is a test for something which we do not know. The test is empirical, and so is the result. He was inclined to think it had some value in typhoid fever. If there was a case in which the diagnosis was very evenly balanced between typhoid and something else and the reaction was absent, he would be inclined to regard the case as not one of typhoid, The reaction must show a blood-red colour, and the froth must be red when the liquid is shaken up. He remembered a case which was diagnosticated typhoid for a long time, but in which the reaction could not be obtained, and the case afterwards proved to be one of acute tuberculosis. The sodium nitrite solution should be prepared fresh each time of testing, as it was very unstable.

The PRESIDENT said that the diazo compounds were very unstable and on this account he was led to doubt the value of the test. He regarded the test principally as a scientific curiosity.

Dr. Dawson, in replying, said that he thought Dr. Purser had put the matter very plainly when he pointed out that the test was principally valuable as a negative test. The test solutions were roughly tested for efficieney by observing whether there was a nitrous smell produced when the acid was added to the sodium nitrite solution.

A CASE OF PHARYNGEAL SPASM.

By H. T. BEWLEY, M.D., F.R.C.P.;

Assistant Physician to the Adelaide Hospital, Dublin.

[Read in the Section of Medicine, May 19, 1893.]

THE subject of this paper was a gentleman—H. S.—who had lived many years in India, whence he came home in 1885. He generally enjoyed good health, but some time ago (I could not make out the exact particulars) he consulted a doctor in Liverpool, who is reported to have told him he had a clot on the brain. He was always more or less a nervous man. There was a doubtful history of former alcoholism.

On September 27, 1892, H. S. went to bed in his usual health; next morning, on wakening, he found himself unable to swallow. He sent for Dr. G. Scriven, who thought he was suffering from some functional trouble. However, he continued unable to swallow, and on this account was sent to the Adelaide Hospital, where he was admitted under my care on the evening of September 30th.

Next morning (October 1st) I saw him. He was a pale and small-made man, but not thin. He seemed nervous and his muscles were tremulous. When lying in bed he suffers constantly from a kind of hiccough, which comes at irregular intervals, sometimes two or three hiccoughs in rapid succession, then a pause, or longer interval. He lies quietly in bed and reads Thackeray to himself. When he tries to swallow he seems to suffer great distress. He says he can get solids down better than liquids. When he takes, say, a piece of bread, he chews it vigorously, gets the morsel into the back of his mouth, and makes swallowing movements; the morsel disappears from his mouth, and would seem, as far as one can see, to have gone down to his stomach, but he exclaims that it is in his throat, and that it is choking him; a quantity of fluid, thick and mucous, gathers in his throat, and gurgles and rattles

excessively. There is some laryngeal spasm, occasional inspirations being whooping and laboured, but there is no real difficulty in breathing. All this time irregular and convulsive movements are going on, he becomes more and more excited, throwing himself about the bed, and beating his chest with his hands; he rolls from one side of the bed to the other, and thrusts his head over the side of the bed, and is about to vomit or spit up the food, but with pains we check him and urge him to try and keep the bread down. At last he will not be restrained, and spits up or regurgitates some, but by no means all, of the bread he had taken, and with it some stringy mucus. When this is done, he lies back quiet in bed, and seems easy. During all this time his pulse is good and quiet, and there is no lividity of the face. The food ejected from the mouth is faintly acid.

With fluids such as milk or water the attempt to swallow is more feeble and quickly over; he does not seem able to get it down at all; the fluid seems to excite spasm of the swallowing muscles, and is quickly spat out, with a quantity of mucus. In the case of bread the struggle may last for six or eight minutes.

He was thirsty but not hungry; tongue clean; abdominal viscera normal; bowels rather confined; heart and lungs quite normal; pulse good; urine contained some mucus and a little albumen.

Last night (Sept. 30th) he was given $\frac{1}{6}$ grain of morphia hypodermically, and slept well.

This morning I applied a Faradic current to his neck; the muscles reacted well, but there was no effect on his powers of swallowing.

In the evening he again got $\frac{1}{6}$ grain of morphia. His temperature rose to 102° F. without apparent cause.

October 2nd—He slept well and quite quietly during the night; there was no hiccough.

This morning temperature is again normal. He is in just the same state as yesterday. He has now been unable to swallow for four days. I got him, with considerable difficulty, to swallow three or four little bits of bread, but the struggle seemed to tire him, and he could not be prevailed on to take any considerable quantity; he could not drink at all.

His general condition is just the same as yesterday; reflexes (knee-jerks, &c.) normal; there is no evidence either of motor or of sensory paralysis. I tried if pressure on the phrenic nerves in

the neck would have any effect on the hiccough, but it had not. I again applied the Faradic current to his neck, and arranged that he should get nutrient enemas every 4 hours, each containing 30 grains of potassium bromide. At night he got his hypodermic as usual.

October 3rd, 6th day of illness.—This morning I waited outside the ward door and listened. There were occasional hiccoughs. I went in and stood beside him. They increased greatly in frequency and violence at once. It looked as if there was violent chorea of the diaphragm and muscles of deglutition with occasional slight spasm of the larynx. The hiccoughs are at irregular intervals—frequent and violent. I got him to try and swallow a little raw meat-jelly. He got about four mouthfuls down. The struggle lasted from six to eight minutes, and then about half the meat came back. The nutrient enemas are well retained—four oz. of milk, eggs, &c. He is strong, and seems comfortable except for the trouble in swallowing. Temperature 98°. His bowels have not moved for three days. I got him to swallow two colocynth pills.

10 p.m.—This evening his condition is still unchanged. He can speak quite well, but is interrupted from time to time by the hiccough. He has tried during the day to swallow a little meat-jelly and bread, but has only got a very little down. His bowels acted well after the pills. His pulse is rather weak.

As he had now been six days unable to swallow, I passed a stomach tube; it was about ½ inch in diameter, and passed with extreme ease into his stomach. As soon as it was down a little of the meat-jelly he had swallowed came up through it. I then poured down about 1½ pints of milk mixed with two beaten-up eggs. He did not suffer from the presence of the tube. There was no spasm of throat or larynx, but occasionally he retched, and I had to put my finger on the top of the tube to prevent the milk coming back through it. When the tube was taken out he was quite comfortable, and lay quietly; his pulse was stronger than before the feeding.

During the next two hours he vomited at intervals, getting up the greater part of the milk, but complained of no distress. About 1 o'clock a.m. he asked the night-nurse to tuck him in, and said he was comfortable and would go to sleep. When she had done this, she went to another part of the ward. On coming to him in about 10 minutes, she found his breathing had stopped.

She called the resident, Mr. F. Wynne, who, running in, found him quite dead, artificial respiration, ether, &c., proving of no use. His death had been perfectly quiet.

I made a *post mortem* examination next day. The arachnoid was slightly thickened in places over the cerebral hemispheres. The convolutions near the great longitudinal fissure were in parts slightly atrophic, the sulci being unusually wide. The floor of the 4th ventricle seemed finely granular, and in the medulla some of the nerve cells were found, on microscopic examination, to be full of brown pigment. With these exceptions the central nervous system appeared perfectly healthy.

The larynx, pharynx, and œsophagus were perfectly and completely normal, as also were all the abdominal organs.

The mucous membrane of the trachea and bronchi was bright red in colour, and was coated with some brown slimy mucus. The lungs were healthy; the heart was healthy. Both right and left sides contained a little fluid blood.

In this instance, therefore, morbid anatomy throws no light on the case. In speculating on the nature of the trouble in swallowing, it occurred to me that the case might be one of paralysis of the œsophagus, and that the presence of morsels of food in this test tube might be the cause of the spasms of the surrounding parts. Paralysis of the œsophagus is a rare affection. Gowers says (Diseases of the Nervous System, Vol. II., p. 269), "In very rare cases such disease has caused difficulty in swallowing, simulating stricture." Ross says (Diseases of Nervous System), "Paralysis of the œsophagus sometimes occurs as an isolated affection. The morsel of food passes from the pharynx into the œsophagus, but owing to the failure of the peristaltic action of the latter, it remains fast in the cervical portion of the tube or regurgitates into the cavity of the mouth. When it remains fast in the œsophagus, it may produce compression

of the larynx and cause dyspnœa and the other symptoms indicative of the presence of a foreign body." The causes which Ross mentions for this affection are—peripheral diseases (rarely), basal affections of the brain compressing the cranial nerves, and local affections of the pons and medulla. Osler (Principles and Practice of Medicine), writes: "Paralysis of the œsophagus scarcely demands separate consideration. It is a very rare condition due most often to central disease, particularly bulbar paralysis. It may be peripheral in origin as in diphtheritic paralysis. Occasionally it occurs in hysteria. The essential symptom is dysphagia."

If some such paralysis of the œsophagus was part of the disease in the case I have described, yet there was much more in addition. The hiccough and occasional laryngeal spasm went on quite irrespective of the presence of food in the œsophagus, and the clinical features of the case looked, as I have said, extremely like what one would imagine to be a violent chorea of the muscles of the larynx and pharynx, and of the diaphragm.

I am also at a loss to account for the sudden death.

NOTE.—Since writing the above, Dr. J. M. Purser has suggested to me that this case was one of some disease of the centres in the medulla, the centre for deglutition being the first one to be affected, and that subsequently the respiratory and cardiac inhibitory centres became involved, hence the sudden death.

DR. PURSER asked how long the patient had suffered from dysphagia before he died. He said he saw a somewhat similar case of an elderly gentleman, about sixty years of age, who had repeated attacks of difficulty in swallowing, and who referred the distress to the upper part of the sternum. When he visited him he had been six days without swallowing anything except very small quantities of fluid, and when the patient diverted his atten-

tion from his sufferings he could talk very well. Operative interference was discountenanced, and a good prognosis was given. In a few hours he was able to swallow without any difficulty. The case was looked upon as one of male hysteria. The chief point of interest in Dr. Bewley's case is the sudden death. This seems to be associated rather with disease of the medulla than with difficulty in swallowing. The parts of the medulla presiding over the movements of deglutition and the respiratory and cardiac movements are closely associated, as illustrated by the experiment of holding your breath for as long as possible and then swallowing saliva, when you are able to hold your breath for a considerable time longer. The frequency of the heart's beats is also increased while in the act of drinking. In this case there may have been some disease about the origin of the pneumogastric nerve which caused, first of all, the incoördination, and finally death. If the movements of respiration stopped first it would probably be a paralytic lesion, while if the heart stopped first it would have been probably an irritative lesion.

The President recalled a curious case which he saw in 1867. The patient, on recovering from cholera, became affected by a spasmodic affection which prevented him taking solid food. He could take only fluid food. If he took solid food he was not able to swallow it, and on one or two occasions he vomited a conical-fluted mass of casein which was lodged in the pharynx or œsophagus. At present he has under observation a lady in whom attempts to take solid food causes intense pain about the cricoid cartilage. He passed a bougie down the œsophagus under the influence of an anæsthetic, but no stricture could be felt.

Dr. Bewley, in reply to Dr. Purser, stated that the dysphagia had lasted about five and a half days.

CASE OF ENTERIC FEVER COMPLICATED BY PURPURA, AND IN WHICH A MALARIAL TYPE OF TEMPERATURE CURVE OCCURRED.

By RICHARD A. HAYES, M.D. Dubl. Univ.;
Physician to Dr. Steevens' Hospital.

The occurrence of purpura, while not uncommon in many other fevers, is, so far as I am aware, so very rarely observed as complicating enteric fever that the following case seems worthy of record :—

Case.—W. R., aged twenty, was admitted to the male private ward in Dr. Steevens' Hospital on the 12th March, 1893, under the care of the writer. It was stated that the patient had been ailing for more than ten days previously, but he was not able to give much information about himself, being on admission very seriously ill.

His temperature was found to be 103°, rising the following evening to 105°. He was very prostrate with soft, weak pulse. Spleen a good deal enlarged; a few rose spots on abdomen, which was tender over right iliac fossa. He had when first seen, and for some days afterwards, profuse diarrhœa. Four days after admission he had two sharp hæmorrhages.

About a week after admission the fever showed signs of commencing lysis, temperature falling and other symptoms improving; but in three days a relapse occurred, the temperature again rising to 102°, with fresh rose spots, &c.

The relapse had continued without any feature worthy of mention for 25 days, the diarrhœa giving place to constipation, when on the 25th day there was a return of diarrhœa, followed next day by two sharp hæmorrhages. Matters then went on almost as before for a week, when, on the 32nd day of the relapse, the patient's gums began to bleed quite freely, and blood appeared in the urine. At the same time blood was also found in the motions, but it appeared to occur in quite a different manner from the hæmorrhages usually observed. It seemed to be rather the result of a continued

oozing than bleeding from a vessel opened by ulceration. Several considerable bleedings also occurred from the nose. While these hæmorrhages were proceeding, the Sister in charge showed me two large patches of subcutaneous hæmorrhage, one over each scapula, and many purpuric spots on the limbs.

These purpuric conditions lasted for nearly a week, gradually subsiding, apparently being influenced by a change in the treatment, which will shortly be detailed. The further progress of the case, ending in a very tardy convalescence, did not present any features of interest.

It seemed quite impossible to account in any satisfactory way for the occurrence of the above curious condition, coming on as it did so late in the course of the disease. The patient was a healthy individual, possessing very considerable stamina, as shown by his steady recovery from an unusually severe illness, and there was, so far as I could ascertain, no history of hæmophilia.

The treatment pursued in relation to this condition, which, owing to the profuseness of the bleeding from so many parts simultaneously, seriously threatened the patient's life, may be shortly mentioned. Previously and up to the occurrence of the purpuric troubles the patient had been getting ♏ 15 doses of spt. terebinth as punch, with brandy as a general stimulant, and disinfectant to the intestinal tract, but on the appearance of the hæmaturia this drug was stopped, as being a possible cause of the hæmorrhage from the urinary tract. After the purpura had continued for some days, and appeared to be quite uninfluenced by several hæmostatic drugs, the turpentine was resumed, and almost immediately the hæmorrhage began to decline, and finally ceased.

This case presented during a part of its course another feature of interest, and, so far as the writer is aware, a rare one in this country—viz., a temperature curve exhibiting well-marked variations of a malarial type in addition to the usual diurnal ones of enteric fever, and which occurred as

follows:—Each third day the temperature suddenly rose 3° to 4°, and as suddenly sank to a level about that at which it had previously stood, and remained there with the usual daily variations until the third day following, when the same large rise and fall took place. These extreme elevations of temperature were accompanied by a condition of rigor, very severe, and lasting sometimes for a period of half an hour, the fall of temperature being accompanied by profuse sweating and collapse. This state of things lasted for 14 days, the purpuric symptoms showing themselves at about the middle of this period. The patient had never suffered from ague.

SECTION OF SURGERY.

ESTHLANDER'S THORACOPLASTIC OPERATION.

By Sir WILLIAM STOKES, Ch.M. Univ. Dub., F.R.C.S.;

Surgeon-in-Ordinary to Her Majesty in Ireland;
Professor of Surgery, Royal College of Surgeons.

[Read in the Section of Surgery, November 11, 1892.]

Among the recent developments of operative surgery applicable in so many instances to regions until lately considered as belonging mainly to the province of the physician, those relating to the surgery of the thorax must be considered as occupying a foremost place.

From what I have experienced in my own practice, and seen in that of others, the conviction has been forced on me that in thoracic surgery we are only, so to say, commencing to tread what is as yet but a dimly lit, and to a great extent unexplored, path; one, however, destined to lead, notwithstanding many probable failures and disasters in the future, to far greater achievements than have hitherto been accomplished by even the most conscientious and skilful surgeons. On the present occasion, however, I desire to confine myself mainly to thoracoplastic treatment of chronic purulent effusion within the pleura—a condition which has so often proved a causal factor of serious secondary mischief, not only in the lungs, but in the brain and other organs, and the successful treatment of which has, as a rule, been found so difficult of accomplishment.

The causes that have been mainly instrumental in enabling us to get more frequently than formerly, successful results in the treatment of empyema arise not only from the adoption of antiseptic practice, but also to carrying out a more thorough and methodical system of drainage. This is especially true in connection with comparatively recent empyemata; but in the chronic fistulous forms of the disease, such as those I am about to draw attention to more particularly, drainage, however carefully and skilfully employed, is not, as a rule, sufficient, though often found to be so in recent ones. I believe the principal reason for this is, that in the latter, the expansile power of the lung though impaired is not lost, and also that the chest walls have not, as regards their natural elasticity, been seriously affected.

If, however, the empyema be of long standing the visceral pleura will become, as a rule, greatly thickened, lose its elasticity, and cease to respond to the lung pressure. Under these circumstances there is an adaptation on the part of the walls of the cavity to its lessened contents by a falling in of the chest wall, and a simultaneous ascent of the diaphragm, combined or aided perhaps by the copious formation of granulation tissue. But there is a limitation to both these actions, and especially in the case of the chest wall, the elasticity of which, owing to long-continued pressure from within, becomes markedly diminished. It is in this condition of things that the surgeon can in many instances so effectively supplement the efforts nature has made to obliterate the cavity.

In considering the subject, therefore, we must distinguish between the cases calling for removal of a portion of one rib to facilitate a thorough drainage of an empyema, and those that call for the performance of what is distinctly a plastic operation, such as Esthlander's, rendering necessary the removal of portions of several ribs to enable the thoracic wall to fall in and obliterate the cavity formed by insufficient

expansion of the lung on the affected side, and the diminished elasticity of the thoracic parietes. It is to the latter class of case that I wish more particularly to draw attention, being one which, in consequence of the probable supervention of the serious conditions likely to follow long-continued suppuration, such as serious visceral disease, acute tuberculosis, septicæmia, cerebral abscess, &c., is of the utmost gravity, and likely to arise if steps be not taken to arrest or check the purulent secretion.

The first case I would draw attention to was that of a man, aged forty-six, Jeremiah Sullivan by name, who was admitted into the Meath Hospital, under my care, on the 10th of June, 1890. He was a native of Kerry, and a farmer by occupation. His sufferings dated from a period four years previously to his admission into hospital. He stated that at that time, after getting greatly heated from some work in a forge he walked a considerable distance home, the weather being very cold and damp at the time. This was followed by a severe cold, accompanied by a great pain in the left side, violent cardiac palpitation, which he referred to the right side, and great weakness. Notwithstanding these troubles no medical or surgical advice was sought for. There was evidently a subsidence of the graver symptoms he had at first, and things remained in a quiescent state for over two years. He then noticed what he termed a "lump" on the left side below and to the left of the nipple. Poultices were applied, and ultimately it—the tumour or lump—burst, when, he said, "about a quart of yellow matter came away." The discharge continued oozing through the opening, sometimes profusely, and at other times in small quantities, until March, 1890; at that time the sinus closed, and remained so for about ten weeks. It then, however, re-opened, the discharge being then more profuse than before, and differing from what it formerly was in consistence and colour, being

much thinner, or more watery, and of a greenish-yellow tint. The patient had shortly before this become much emaciated, having lost, as he said, "all his weight." On his admission he had an anxious, drawn, haggard expression, was very anæmic and thin. The left side was rather flat compared to the right, over the left base was loss of vocal fremitus, and from the fourth intercostal space downwards complete dulness on percussion. The circumferential measurement on the right side at the nipple was 18½ inches, and on the left 17 inches, and the same difference was observed on measurements being taken 3½ inches lower down. Three small openings close together in the 10th intercostal space, in the middle axillary line, were observed, from which a thin, sanious, purulent discharge exuded at each inspiration. The heart sounds were normal, but very weak. Having regard to the age of the patient, the great chronicity of the trouble, and the weak and emaciated condition of the patient, the case could not be looked upon as one favourable for any operative interference, but still, I deemed it one on which Esthlander's operation might exercise a beneficial influence, and possibly be a means of saving, or at least prolonging, his life. Accordingly, on June 20th, I made by a lunated incision a large oval-shaped flap. I exposed the bodies of the 5th, 6th, 7th, and 8th ribs, and portions of each of them having been carefully denuded of periosteum by Ollier's raspatory were removed, which was accomplished without difficulty, the membrane being thickened and loosely applied to the bone. The bones were divided by fine resection saws, and partly by forceps.

A free opening was now made in the pleura, which was much thickened, and a large quantity of thin unhealthy-looking pus was evacuated. I then thoroughly washed out the cavity with a warm bichloride of mercury solution, and a full-sized drainage-tube was left in the wound.

It is unnecessary to give the daily reports of the case after the operation, but on July 10th the report is "the patient looks bright and strong, has a good appetite, and sleeps well. The openings have now altogether disappeared." On July 14th the report states there was "no discharge," and the same report on the 17th. Shortly after this, the patient being practically convalescent, I left town for some weeks, and during my absence I was grieved to learn that my patient got a violent attack of choleraic diarrhœa, and notwithstanding that the most prudent and energetic measures were adopted by the resident surgeon, Dr. Newell, to check the disorder, the patient ultimately sank from exhaustion.

In the next case happily no untoward circumstance during convalescence such as that mentioned in the last one prevented ultimately a complete recovery being obtained. The case is in truth one of great importance, resembling in many respects the well-known one of Professor Schede, of Hamburg, which was exhibited at the International Medical Congress at Berlin, and which created so much interest.

Joseph Hill, aged forty-seven, a lighthouse keeper by occupation, and residing at Howth, was admitted under my care into the Meath Hospital, on September 14th, 1890, recommended to me by Dr. Doyle. On the previous January the patient had an attack of pleuritis on his left side. He recovered as he thought, but erroneously, for the pain continued, and for this blisters were applied, which apparently had the effect of relieving him temporarily at all events. About a month subsequently he noticed a swelling in his side just under the nipple, accompanied with great pain, which increased as the swelling grew larger. Poultices were applied for about six weeks. There were indications of a pulmonary fistula having formed, as occasionally large quantities of what he termed "thick creamy stuff" were

discharged by the mouth. The patient then entered one of the hospitals in this city, where the swelling was punctured, and the patient stated—the statement probably being exaggerated—that "about five pints" of pus came out. He left the hospital in June and returned to Howth, where he came under the care of Dr. Doyle. Poultices were applied at first, and subsequently the cavity was flushed with a weak carbolic solution, and antiseptic dressings were applied. Generous diet and a generally tonic treatment was recommended, and in the course of a month a marked improvement took place in the patient. The discharge, however, though much diminished in quantity, still continued, and Dr. Doyle, believing that surgical operative treatment was indicated, recommended him to my care. The patient on his admission was much emaciated and anæmic. At times he got paroxysms of cough and the expectoration was distinctly purulent. He slept well and his appetite was fairly good. The circumferential measurement of the chest was 33 inches, the right half 17 inches, the left 16 inches. There was slight but still obvious dexio-cardia. His pulse was 100, rising towards evening to 120. At that time there was a corresponding rise in temperature, being in the morning practically normal, but rising towards night to between 101 and 102°. There were no physical signs of any pulmonary tubercular mischief. The patient remained under observation and treatment until Oct. 1st, when I determined to operate. The patient being anæsthetised by chloroform, I exposed the ribs by a lunated incision, the centre of which was crossed by the mid-axillary line about three inches behind the previous opening. The flap was then dissected back and the ribs were found so closely approximated as almost to obliterate the intercostal spaces. Portions of four ribs were excised by a fine saw and bone forceps, the portions removed averaging 1¼ inches in length, the periosteum, which

was thickened and loose, having previously been detached from the bone with Ollier's raspatory and with great facility. A large quantity of pus was then evacuated and the cavity thoroughly flushed with a warm boric solution. A full-sized drainage tube was then inserted into the pleural sac, and the edges of the wound brought together by carefully asepticised silk sutures. The patient got very cold and weak while on the operating table and coughed a good deal when the drainage tube was inserted. Iodoform dressings were applied, which at that time I believed to be superior to any other; boracic acid being what I get the best results with now.

After the operation the progress of this patient to recovery though slow was uninterrupted. He left the hospital early in November free from all cough, materially increased in weight, appetite good, able to sleep well, and the wound and sinuses completely closed; he soon after was enabled to return to his duties as keeper of the lighthouse at Howth, a post which he still holds, and the responsible duties of which he efficiently discharges.

I have assisted my colleague, Sir P. C. Smyly, in three cases in which he performed Esthlander's operation. Two of the patients were females, aged respectively twenty-five and twenty-eight years, and the third case was that of a boy, aged five years, who was operated on in the Meath Hospital in February, 1891. He had previously been under the care of a medical practitioner in the country, who treated him for pleurisy and tapped his left side, withdrawing thence a pint of pus. After a week the side filled again and it was poulticed. This treatment went on until October, when he began to cough up pus. In December, 1890, he was taken to Cork to be operated on, but owing to the excessive flow of pus from his mouth when the patient was turned over on the healthy side, in order to reach the situation where the operation was to be performed, it was not considered safe to

proceed further, and, accordingly, it was determined to abandon operative interference. He was taken home, and shortly afterwards was sent up to Dublin for treatment. On February 6th Sir P. C. Smyly operated and removed substantial portions of two ribs, evacuated a large quantity of pus, and inserted a full-sized drainage tube. The same difficulty arose in reference to the escape of pus from the mouth threatening suffocation when the patient was turned over on the healthy side. This complication was obviated to a great extent by drawing the patient towards the edge of the table so that the affected side should be well over it, and the operator then getting below and behind the patient was enabled to carry out the steps of the operation without turning him over on the sound side at all.

The drainage was kept up till February 26th, when the tube was removed, and shortly afterwards the wound closed. On March 20th the patient left the hospital perfectly well. No purulent expectoration was observed from the day the operation was performed. The boy has been in excellent health ever since.

An equally good and permanently good result was obtained in the case of one of the ladies operated on whom I have previously alluded to. The symptoms in her case were of a very serious and alarming character. She was very emaciated, anæmic, and had profuse night sweats, and suffered greatly from purulent expectoration, and all the symptoms and signs of pleuritic effusion were present in a marked degree. The diagnosis of empyema was made, which was subsequently verified by removing some of the contents by a hypodermic needle—an instrument which has so largely taken the place of the stethoscope in estimating the nature of these cases.

In this case portions of three ribs were removed, the pleural cavity flushed, and free drainage employed. The

progress to recovery was very satisfactory, and her good health has been maintained ever since.

In the third case, which had many features in common with the last one, and which was operated on in a similar manner, the patient sufficiently recovered to be able to go to the Engadine, in Switzerland. About eight months after the operation, however, pyæmic symptoms unhappily were developed. Purulent deposits in the shoulder and other situations occurred, followed by symptoms of cerebral meningitis, which ultimately proved fatal.

There still exists much difference of opinion as to whether thoracoplasty should be regarded as only suitable, and in truth solely restricted to chronic fistulous empyemata, and the cases that have frequently been tapped or aspirated, or whether it should be adopted, as in two of Sir Philip Smyly's cases, as a primary operation. The drift of surgical opinion judging from the writings of those, notably Mr. P. Gould and Mr. Godlee, who have taken a special interest in this procedure, would point in the direction of confining the operation to those cases where what has been somewhat oddly termed the "natural" cure of empyema has not been accomplished—viz., the one which it is alleged generally results from a drainage operation methodically carried out. Mr. Gould states that it is important to emphasise this, lest the success attending it should tempt the surgeon to perform the operation merely to save time. The severity of the operation is such that it is only justifiable when it is plain that it is demanded to save life.—(*Lancet*, Feb., 1888).

Instead of making such a sweeping declaration as to the cases suitable for this operation, and regarding it solely in the light of a *dernier ressort*, it would, I think, be preferable to base the discrimination of these cases on different lines. Although it is not possible as yet to publish any formidable statistics of the operation performed in this city, our

experience, such as it is, amply justifies us in questioning decidedly the often-expressed view that it should be regarded in the light of a "forlorn hope" operation. The cases that have been operated on in Dublin, happily, as a rule, with such signal success, by our President, Sir P. C. Smyly, Mr. Kendal Franks, Mr. Swan, Mr. Thornley Stoker, Mr. Heuston, and myself, all forbid the adoption of so gloomy a view. On the contrary, the experience derived from these cases is of so encouraging a nature as to make one venture to predict that the operation will ultimately be deemed applicable to a larger range of cases than at present, and not be generally regarded merely as a supreme and final effort to save life fast ebbing away under the baneful influence of protracted suppuration, but rather as a means to prevent a condition of things which, once established, so often leads to a fatal termination. I think, therefore, that it is not premature to express the opinion, that in deciding on the applicability of the procedure in any particular case we should be guided largely by the consideration as to what was the length of time that had elapsed since the development of the empyema in all cases where it is possible to obtain accurate information on the subject. If, for example, the disease had lasted four or five months, a sufficient time to diminish the normal elasticity of the thoracic parietes and allow the pleura to become thickened, infiltrated, and lined with soft, spongy, easily bleeding granulation tissue, and have, perhaps, deposited on it a quantity of thick jelly-like coagulable lymph, and the fluid contents, as they often are, fœtid, then I should say that drainage alone would probably be found insufficient, and the plastic operation be attended, as it hitherto has been in so large a number of cases, with satisfactory results. It must be remembered, too, that in hospital practice, at all events, it is the chronic cases that we are usually called upon to deal

with. All hospital surgeons and physicians of experience know how frequently it happens that patients postpone seeking advice until the time has passed when a less hazardous operation than the one that has ultimately to be performed would have amply sufficed. Cases of empyema are not exceptions to this rule, and if the case be of long standing in which there is evidence of exhaustion from continued suppurative discharge through pulmonary or pleural fistulæ, thoracoplasty, after methodical exploration to determine the length, depth, and size generally of the cavity, on which will depend the number of ribs or portions of ribs to be removed, should then, I think, be performed without delay, and in the majority of cases will be attended with good results.

As regards the line of incision to make over the ribs to be excised, various recommendations have been made. Esthlander made a transverse incision over the centre of the intercostal space between two ribs to be removed. Jacobson has recommended two, three, or more flaps, each presumably of small size; Mr. Gould a vertical incision in the centre of the cavity; and, lastly, the large oval flap method. In the cases I operated on I adopted the latter, the lower edge of the flap corresponding or nearly corresponding to the opening made subsequently for the drainage tube; but it seems to me that it is not a matter of very prime importance which of these lines of incision are selected, so long as we get the field of operation sufficiently clear and the osseous structure to be dealt with fully exposed. A more important point is to determine the situation where the opening into the pleural cavity should be made. Mr. Godlee recommends a point corresponding to the ninth rib and a little external to the angle of the scapula. Mr. Heuston suggests the eighth intercostal space slightly posterior to the scapular line. He bases this recommendation from experiments on subjects,

finding that "in that position there is less danger of implicating the attachment of the diaphragm or opening into the abdominal cavity if the incision be made through the eighth intercostal space. In fact on the dead subject when opening into ninth intercostal space I was never less than the breadth of a rib from the diaphragm, and consequently would have no hesitation in opening through the ninth space."

Although quite sensible of the signal advantages obtained by making the pleural opening in as depending a situation as possible, it must be borne in mind that the results of experiments of this kind alluded to, on subjects in which there was no evidence of previously existing pleural effusion may be misleading, and I cannot but think that having regard to the way in which in chronic empyema the diaphragm is as a rule displaced or drawn upwards, that selecting situations for making the opening so low down as those recommended by Mr. Godlee and Mr. Heuston, would, in a large proportion of cases, be attended with some peril, for implication of the diaphragm could not be looked upon in any other light than as a calamity which, under the circumstances, could hardly be recovered from.

Another very important point in connection with this subject relates to the question of flushing the pleural cavity after evacuation of its purulent contents. Some surgeons are very apprehensive about doing this in consequence of deaths having occurred during injection. It is difficult to account for or explain the cause of such disasters. Happily in Dublin no case of the kind has, so far as I am aware, occurred. In the cases I operated on, and in those I have assisted at, copious flushing was adopted both during and subsequent to the operation, and no symptoms ever arose that gave cause for any apprehension. In cases of large empyemata, where there is danger of weeping hæmorrhage into the cavity of the pleura, consequent on the sudden

removal of pressure from the granulations, asepsis can hardly be anticipated if the numerous blood-clots specially liable to decompose are left in the cavity. Their removal, therefore, by copious and frequent flushing is a matter of prime importance, and what I think is best adapted for the purpose is a warm boric solution.

At the commencement of this communication I alluded to recent developments and advances in operative surgery. Among these Esthlander's operation will, I think, be accorded a foremost place, and be regarded as among the many kindly fruits that have come to us from the ever-extending and healthy growth of antisepsis, which has enabled us, under its beneficent, protecting, and often magical influence, to advance so far and accomplish so much, and the discovery and fostering of which must ever signalise the era in which we have lived and worked.

Mr. Heuston said that in the admirable paper of Sir William Stokes he had hit on the keynote in the treatment of empyemata when he stated that the method to be employed depended on the duration of the purulent effusion. To talk of any one method of treatment for all empyemata was quite irrational. In reference to Esthländer's operation, it was required only in cases of very long standing, where the conditions as mentioned by Sir W. Stokes existed, and gave rise to a space which could not be occluded unless the chest wall were allowed to adapt itself to the collapsed lung. In the performance of Esthländer's operation it was important that the periosteum of the rib should not be preserved to a great extent, as it was liable to form new bone to such an extent as to do away with the object of the operation. In the more recent cases operated on by Mr. Heuston he turned the flap of periosteum over the end of the rib where it had been cut across, and thus hindered the absorption of the discharge by the cancellous bony tissue, to which he ascribed the immunity of his patients from pyæmia, which some authors consider the greatest danger from this operation. Mr. Heuston expressed his thanks for the flattering

mention made of his paper, and in reply to Sir W. Stokes, wished to state that he never injured the diaphragm in the many operations he had performed, although he always selected the eighth interspace in the scapular line for his incision. This position presented a great advantage over those incisions made on the anterior or lateral chest wall, in the fact that here the ribs were so fixed by their vertebral attachments that there was not the danger of the tube being occluded by the ribs falling together, which Mr. Thornley Stoker mentioned was so frequent in the cases where the incisions were made more anteriorly. The only point in Sir William Stokes's paper with which he (Mr. Heuston) was not, from his practical experience, inclined to agree, was in the utility of frequent washings of the pleural cavity; and always, in recent cases, he employed only one washing—viz., at the time of the operation, to remove any semi-solid lymph which might be within the pleural cavity, and he had found, by the occasional introduction of an antiseptic which dissolved slowly within the cavity, that even where the discharge is fœtid at the time of operation, it becomes quite sweet within a few days, never to resume its fœtid character.

Mr. Thornley Stoker and Dr. Doyle also spoke.

ACTUAL SIZE.

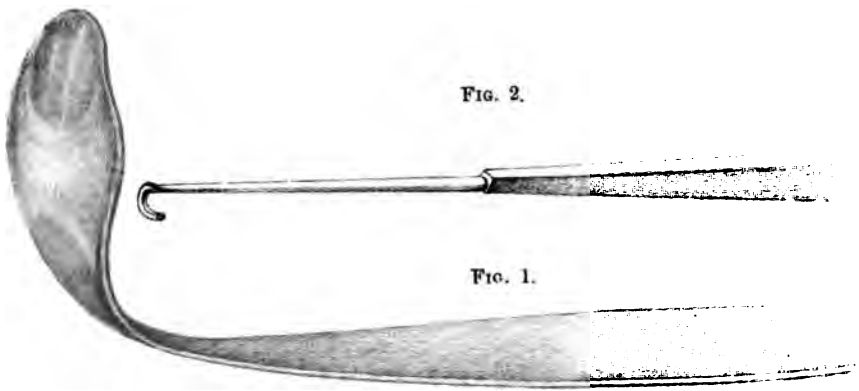


FIG. 2.

FIG. 1.

ON THE OPERATIVE TREATMENT OF TRIFACIAL NEURALGIA.

By WILLIAM THORNLEY STOKER,

Surgeon to the Richmond Hospital;
Vice-President of the Royal College of Surgeons in Ireland.

[Read in the Section of Surgery, January 20, 1893.]

The sufferings produced by some forms of trifacial neuralgia are so great, the malady is so common, and generally so intractable, that any contribution to its literature will be welcome alike to physicians and surgeons. It is one of those complaints which, for many reasons besides its therapeusis, is common ground to both branches of our profession. Therefore, although the points I propose to speak of are purely surgical, they will, in view of the frequent failure of medical treatment in neuralgia, recommend themselves to physicians no less than to surgeons.

It is as an outcome of recent advances in the special surgery of the brain, as well as in modern methods of operation, that increased attention has been called for the last year or two to the operative treatment of neuralgia of the fifth nerve in cases where other means have failed, and where life or comfort is threatened by intense suffering. The able papers of Professor Horsley in November, 1891, and of Professor William Rose in the beginning of 1892, are the most remarkable writings on this subject in England, and are what might have been expected from so distinguished and original an investigator as the former and so bold and skilful a surgeon as the latter. But operations on nerves for the relief of pain, although called into added notice of

late, are by no means new procedures. Of the four methods of treatment to which I shall have to allude—neurotomy, neurectomy, stretching, and avulsion—neurotomy, or section of a nerve, was suggested as far back as the time of Galen, and practised 150 years ago; neurectomy, or removal of a part of a nerve, was performed by Abernethy in 1793; stretching was introduced in 1860; and avulsion is the only method that can claim a very recent birth, having been first practised by Professor Thiersch in 1889.

1. As regards the operation of neurotomy, or mere division of a nerve, it may be briefly dismissed. It usually gives only temporary relief, as the cut ends sooner or later unite and pain is re-established. This observation applies to cases in which, neurectomy being performed, only a short piece, amounting, perhaps, to half an inch, of the nerve is excised; for, even then, the ends have been known to become united, and sensory function restored. I can myself record such an incident in more than one case.

2. Stretching is also a proceeding of limited use, being of suitable application, as a rule, only in the cases of mixed nerves. In neuralgia affecting spinal nerves, such as the sciatic, where a motor as well as a sensory function forbids division of the trunk, this treatment, although usually only temporary in the benefit it confers, is defensible, not only for the relief it gives for a longer or shorter time, but for the stronger reason that it is the only final surgical method permissible. In the cases of purely sensory nerves, such as most of the divisions of the fifth, another rule seems to apply. In spite of the advocacy of stretching—for instance, by Mr. Walsham in December, 1891 (*Brit. Med. Jour.*)—I cannot think that a good case is made for the operation, and it seems that the very instance he records in which he has within ten or twelve years stretched the inferior dental nerve five or six times in the same patient for recurrent

neuralgia of that trunk, is in itself a strong argument against his practice, and that a neurectomy would have been more effectual and not open to any grave objection.

That stretching a nerve may give relief of greater or less duration is not denied, but in neuralgia of the sensory divisions of the fifth I am disposed to advocate a more radical proceeding, and, if stretching be employed, to use it in conjunction with neurectomy as a means of reaching the proximal part of the nerve trunk between the seat of operation and the brain. Here it may become an additional means of avoiding a return of pain, and at all events it gives a patient a chance of being spared the formidable proceeding of opening the skull to remove the Gasserian ganglion. In a case I shall presently mention in which I removed the infra-orbital nerve by open operation, it may be assumed that the stretching consequent on avulsion, which was a part of my procedure, has had a good effect, for no pain has returned in the proximal part of the trunk which remains attached to the brain.

3. The operation of avulsion has been variously performed. In its latest method, as developed by Prof. Thiersch, it is done by exposing the nerve trunk at some convenient point, isolating it, seizing it with a forceps, dividing it at the peripheral side of its exposed point, and by twisting and traction removing as much of its proximal part as is possible. It will be easily conceived that this operation is much superior to neurotomy, and combines the advantages of a limited neurectomy with those of stretching. It is open to the objection that it is blindfold and uncertain in its extent, and therefore unscientific. It seems much more reasonable to expose the nerve trunk and see exactly what we are doing. Avulsion should, I think, be reserved for those cases where complete exposure is not possible, or where for some other reason it is not deemed expedient. In connection with this

treatment we must not overlook the difference between avulsion, which, owing to the connections of a nerve, is likely to tear it across at some point removed from its cerebral attachment, and a traction at such a place or exercised in such a manner that it is capable of tearing a nerve from its cerebral origin. While the former is a justified proceeding, it is not to be forgotten that the latter is on trial, and that in the case published by Prof. Horsley, where he exposed the Gasserian ganglion and avulsed the trunk of the nerve from its pontal origin, the patient died in a few hours from shock.

4. The operation of neurectomy seems, on the whole, that which alone, or combined with avulsion, is most exact, most scientific, and most likely to give good results. I do not propose to enter into the general consideration of neurectomies of the 5th nerve, but to deal with those of which I have had practical experience in the living subject—namely, the gustatory and the second division. Suffice it, as regards the rest, to remark that numerous operations have been proposed and practised on all the divisions of the trifacial nerve, that they have been so far established as meritorious and recognised surgical procedures, that in the case of each nerve the question is not whether, due cause existing, operation is justifiable, but rather which mode of performance best suits the particular case.

As for the final and capital question, whether operations on the trunks outside the skull being inexpedient or, having failed, it is right to open the cranium and remove the Gasserian ganglion, judgment must for the present be suspended. The brilliant work done in this direction seems to promise a future for this bold proceeding, but it is not my province at present to do more than refer to it, and to say two things—first, that the method devised and practised by Rose of approaching the ganglion through the pterygoid

fossa commends itself to me much more strongly than Horsley's operation of opening the middle fossa through the temporal region, and gaining access by raising the temporo-sphenoidal lobe; and second, that either of these operations would have no chance of success except in the hands of a surgeon of accomplished method and with an exact practical acquaintance with the anatomy of the parts. I am aware that I am using a dangerous argument when I say that either of these operations could not be undertaken by surgeons of ordinary training and expertness, and I am slow to state it, but their difficulty is so very great that I think they are practically out of reach of many able and skilful men.

3rd Division.—Concerning the 3rd division of the 5th, I have to say that I have frequently divided or removed its gustatory branch on one or both sides, usually to relieve the pain of cancer of the tongue, and once for neuralgia. Various means of reaching the gustatory nerve have been proposed, either from the mouth or from the outside. Those operations which approach the nerve from the outside are—the retro-maxillary and the transmaxillary, with their various modifications. These operations are much more formidable than that through the mouth, and although they are advocated by both Rose and Horsley to the exclusion of the intra-buccal method, I agree with Mr. Walsham, who pleads strongly in favour of the latter. The objection to the operation in the mouth, on the ground of the liability of the wound to septic infection, is more theoretical than practical. I have done the operation through the mouth often, and have never seen trouble of this kind, and we all know how rapidly and safely the most formidable mouth-wounds heal. There are cases where the more free access afforded by the retro- or the trans-maxillary operation is demanded, but they are not common. Also there are cases of advanced cancer

of the tongue, where it would be difficult or impossible to find the gustatory nerve through the mouth, and where, if operation on it were demanded, it had better be done from without. Supposing such a course to be necessary, the transmaxillary operation of trephining the ramus of the jaw, as recommended by Velpeau and modified by and practised by Rose and Horsley, is, I think, the best. It permits removal of considerable portions of both the inferior dental and gustatory nerves. For all ordinary purposes, however, operation through the mouth, which is a much more simple proceeding, suffices, and the particular operation which best exposes the inferior dental and gustatory nerves is that of Paravicini. It is performed by gagging the mouth wide open, retracting the cheek, incising the mucous membrane and periosteum for about an inch parallel to and a line or two behind the anterior edge of the ramus of the jaw, the incision extending down behind and below the level of the last molar tooth. The soft parts are then stripped off the jaw or pushed backwards with a director so as to expose the dental foramen. Walsham, who advocates this operation strongly, advises that the periosteum should not, as in the original proceeding, be removed from the jaw, and my own experience leads me to coincide with him. In the middle of this incision the inferior dental nerve can be found, and in the lower part of it the gustatory, and one or both can be lifted with a blunt hook, stretched, and a portion of its trunk removed. The operation for division of the gustatory, by a short incision behind and below the last molar, without exposing the nerve to view, as practised by Hilton, I have not done of late years. It is blindfold, the nerve may be missed, I have seen troublesome bleeding from division of an arterial twig, and the nerve will probably rapidly reunite. It is better to expose the nerve by the method of Paravicini and remove a portion of it. Several advantages attend this

more thorough exposure besides the certainty it offers of not missing the nerve; it permits neurectomy instead of mere division, it exposes both nerves, it allows of stretching being added, and it is free from the risk of hæmorrhage, as the nerve to be divided can be separated from any arterial connection.

2nd Division.—With regard to the 2nd division of the 5th nerve, the operation of resecting it on the cerebral side of Meckel's ganglion is one which has lately come into prominent notice. It is indicated in those intense cases of facial tic which engage the entire distribution of this nerve, and where experience shows that other treatment or any operation on the distal side of the spheno-palatine branches yields no good result, or only a temporary one. Clinical and operative experience have of late pointed very clearly to the inutility of operations other than those performed on the nerve at its exit through the foramen rotundum and on the proximal side of the branches to Meckel's ganglion.

Three operations have been proposed in order to expose this 2nd division at the base of the skull in the pterygo-maxillary fossa:—

1. The orbital;
2. The antral; and
3. Pterygo-maxillary.

The last of these—the pterygo-maxillary—is a very formidable and long proceeding, which seems to me to have nothing to recommend it. It is claimed for it that it produces a cicatrix at the side of the face where it is not disfiguring, and that it avoids the danger of septic infection consequent on the engagement of the antral cavity in either of the other operations. In answer to this I say that the orbital method which I have practised does not produce a disfiguring cicatrix, and that the danger of infecting the antrum, if the operation be properly done, is too remote to be considered as weighing

against a measure of much greater magnitude, and which involves the probable ligature of the internal maxillary artery.

The antral operation has nothing that I can see to recommend it as compared with the orbital; it is more severe, more disfiguring, and has no compensatory advantage. The orbital operation of Wagner, as practised by Horsley, is the one I have followed. It is easily done provided no mistake is made, it affords sufficient access to the pterygo-maxillary fossa, and it leaves no mark if skilfully performed. It has been done in Dublin by Mr. Brooks as well as by me, and I think he can bear out all that is claimed for it.

The operation is done as follows:—

(*a*) The eyelids are stitched together by a point of fine suture inserted ¼ in. from their ciliary margins. This serves the double purpose of excluding irritating lotions from the eye, and of fixing the parts.

(*b*) The position of the infra-orbital foramen is then found; it lies in the course of a line drawn from the supra-orbital foramen to the interval between the upper bicuspids, a little inside the mid-orbital line.

(*c*) A curved incision is carried along the lower edge of the orbit and parallel to it; it should divide all tissues down to and including the periosteum. A vertical incision is made downwards from this for ½ to ¾ inch corresponding to the position of the foramen. The tissues having been dissected aside, the foramen is readily felt with a probe, and the nerve and artery found at their exit.

(*d*) The nerve should then be separated from the artery, seized with a clip-forceps close to the foramen, and divided on the distal side of the forceps. The artery, if necessary, may be tied; I did not find it necessary to ligature it.

(*e*) The periosteum of the floor of the orbit is next raised with a flat director, and as it is very thin, care must be

taken not to tear it. Should it be torn, prolapse of the orbital fat into the wound takes place, and complicates the operation.

(*f*) The contents of the orbit are then raised from the floor by an assistant, using a retractor I have had made for the purpose, and which is depicted in the accompanying plate (Fig. 1).

(*g*) The upper boundary of the infra-orbital foramen is then removed with a fine bone-forceps, taking care to make the opening as small as possible, as if too wide the tissues of the lid may sink into it and produce disfigurement. The upper wall of the canal is then removed, either with a fine forceps or with a small director. This wall is so thin as to offer no resistance, and usually only covers the anterior half of the canal, which in the back part of the orbit is a mere groove.

(*h*) The nerve is then lifted from the canal by the attached forceps, and by working along it with an instrument such as that shown in the plate (Fig. 2), can be freed and exposed as far back as the pterygo-maxillary fossa without much trouble. If there be any oozing it can be checked by packing the cavity for a minute or two with pieces of hot sponge.

(*i*) The nerve may then either be divided at the foramen rotundum by fine curved scissors, or seized with a forceps as far back in the fossa as possible and avulsed from its basic attachment by a process of pulling and twisting. I removed it by the method of avulsion, and I think it best because it affords a hope of relief in case the seat of the disease is at the point of exit from the skull or behind it. It is more than probable that many neuralgias have their origin in a narrowed foramen or in duramatral changes of other kinds.

If the antrum has been opened it should be filled with powdered boracic acid. In the case I operated on I dusted

the wounded surfaces thoroughly with boracic acid and iodoform, removed the suture in the lids, closed the wound by catgut sutures, and bandaged the eye with suitable gauze and cotton dressings.

With regard to the cases in which I have divided or resected the gustatory nerve in cancer of the tongue, I need make no remark beyond what I have said in stating my opinion on the general question. The one instance in which I have performed this operation for neuralgia is an incident of the following case:—

CASE.—Miss E. P. was brought to me by her brother in August, 1891. She was sixty-eight years of age, extremely spare, attenuated by suffering, and of marked pallor. Her neuralgic trouble dated back to about thirty years previously, when she was seized by a severe pain in her left shoulder and arm, which resulted in some impairment of sensation in her fingers which has lasted ever since. She came of a gouty family, and her fingers and toes were much deformed by gouty deposits. She had suffered from neuralgia of the right trifacial nerve for twenty-five years, of the attacks of which I got the following history:—They occur at all times of the year, and during all kinds of weather. The pain comes on gradually, increases in severity, and lasts for uncertain periods, varying from five or six weeks to as many months. The remissions are seldom complete, and much less so latterly. The second and third divisions of the nerve have been affected, sometimes separately, at other times together. About ten years ago the tongue first became affected, but the pain in it did not become severe until about two years before she came under my observation. She had been treated by numerous physicians, including Brown-Séquard, had taken every conceivable drug, and been sent to all sorts of health-resorts, but without receiving any permanent benefit. I need not describe the attacks of pain, they were of the most extreme character, belonged to the dreadful form of neuralgia named by Trousseau "tic épileptiforme," and were, as is usual in this disease, attended by spasms of the muscles on the corresponding side of the face, sometimes extending to the neck and shoulder. Her state of suffering was indescribable, and at the time I saw her she was dying from the joint effects of pain and inanition,

being unable to swallow owing to the tongue-pain. She had been sustained for some time by nutritive enemata, and had taxed the trained resources of Dr. Jacob, of Maryborough, who had seen her frequently in consultation, to the last degree.

At the time she came to me in August the only seat of pain was the tongue, and as her condition was so urgent as to demand immediate treatment, with the approval and assistance of Dr. Jacob I exposed her right gustatory nerve by Paravicini's method on September 2nd, 1891, and removed about half an inch of it. In order to allay the epileptiform habit, she was then given ʒi. of bromide of potassium and ʒss. of tr. of digitalis three times a day. She got immediate relief. Some twinges of pain which remained in the tongue and lower lip gradually disappeared, and in a couple of weeks she went home in restored health and free from pain.

In March, 1892, six months afterwards, the disease recurred in the entire distribution of the superior maxillary nerve, and as it refused to yield to medical treatment, and was rapidly destroying her, it was resolved, in consultation with Dr. Jacob, to remove the affected nerve by the operation I have described. She was so reduced by April 3rd, the day of the operation, that she could not be brought to town, so, assisted by Drs. David and William Jacob, I removed it at her own home in the country.

The dressings were removed by Dr. Jacob on the third day, and the wound was found to have completely healed. A few twinges of pain, but of no particular moment, were felt for some days after the operation, but they gradually disappeared, and from April 3rd up to December—that is to say for eight months—the lady remained quite free from pain. Such an interval of peace she had not known for thirty years; she improved in health, increased over one stone in weight, and was, when I saw her last, in excellent condition, without any deformity from the operation, and seemed to have taken a new lease of life.

The nerve removed was examined by Professor Scott, who has supplied the following report:—The general nerve bundles in the specimen are apparently perfectly normal. The blood-vessels are also normal, and have no evidence of endarteritis. In some very small nerve bundles lying in the interfascicular connective tissue, and which contain only about a dozen nerve fibrils, some of the fibres have lost their myeline sheath. In one case the whole little bundle is affected; in another all but three or four fibres, which seem normal. This loss must be due to some commencing dege-

nerative change in these small nerves. As far as I could make out, the axis cylinders are not much affected in shape as yet. I could not see the "oyster-shell" appearance described by Schweinitz, nor any evidence of an acute neuritis.

In the latter part of December, 1892, the neuralgia in its most aggravated form made its reappearance in the distribution of the 3rd division of the 5th, on the right side, including the tongue. This did not, of course, impair the prestige of the operation on the 2nd division of the nerve, but it showed the possibility of re-establishment of the function of a nerve when only a short section of it has been removed, for I took over half an inch of the lingual away by the first operation. The subsequent diminution of the degree and area of anæsthesia has been noticed in several cases of division of the 5th nerve. It is interesting in connection with the researches of Dr. Brooks on the subject, and his observations of the extensive anastomoses which exist between nerves. It is, of course, doubtful whether the return of pain in the tongue in this instance was due to union of the divided trunk or to re-establishment of the function of its periphery from the development of anastomoses.

The question of an operation on the trunk of the 3rd division of the 5th above the origin of the gustatory has since been entertained, but for reasons which I need not relate has not been decided on. The lady has now (February, 1893) recovered the late attack of neuralgia of the 3rd division, and is in good health.

CONCLUSIONS.

1. That in cases of trifacial neuralgia demanding operative treatment neurotomy is not usually a satisfactory or efficient operation.

2. That in purely sensory nerves stretching is at best but

a temporary expedient, and either should not be undertaken, or having once been performed and followed by a return of pain, should not be repeated.

3. That the reasonable treatment in trifacial neuralgia of an extreme character is neurectomy, and that while the operation on divisions of the 5th nerve external to the cranial cavity may be regarded as an established procedure, the ultimate operation of removing the Gasserian ganglion must still be considered as on its trial.

4. That avulsion should only be practised as a part of an open operation, and that, as originally proposed by Professor Thiersch, it should be regarded as a blindfold and unscientific proceeding, to be undertaken only when an open operation is for sufficient reasons impossible or inexpedient.

Mr. Swan thought that the Academy owed a debt to Mr. Stoker for his communicaiton. It was distinctly a new subject, and such operations had not, so far as he was aware, been often performed in Ireland. He confessed, however, that it appeared to him that until the seat of the lesion in the nerve could be accurately localised it was to some extent working in the dark to remove any part of it on the chance of curing a neuralgia. Perhaps experimental physiologists might soon be able to diagnosticate the exact focus.

Mr. Brooks—I venture to join in the discussion on Mr. Stoker's valuable paper, partly because I have recently had a case of neuralgia of the superior maxillary division of the trigeminal under my own care, and partly because operations on the fifth nerve involve many anatomical points. The patient to whom I have alluded was a man of about forty-eight years of age, who was sent from the County Wexford to Sir Patrick Dun's Hospital. He had suffered from neuralgia for over seven years, and stated that the pain had been almost intolerable for the last six years. While he was speaking to me a paroxysm of pain came on, accompanied by convulsive twitching of the right side of the upper lip and ala nasi. He stated that similar paroxysms almost always came on when he moved his upper lip, as in speaking or eating. The pain was always localised in the right side of the upper lip and ala

of the nose, and often in the incisor and canine teeth of the same side. He occasionally had slight pain in positions corresponding to the distribution of the temporal and malar branches of the orbital nerve. Hence it appeared that the disease was limited to that part of the nerve which is contained in the bony groove and canal in the floor of the orbit, and had not extended as far back as the spheno-maxillary fossa. I operated on the 11th of August last by the orbital method of Wagner and Victor Horsley. I made an incision along the lower orbital margin and a short vertical cut down to the infra-orbital foramen. I then raised the periosteum from the floor of the orbit with a Farabeuf's rugine and removed the roof of the infra-orbital canal with bone forceps without opening the antrum. At this stage of the operation I noticed the unusual thickness of the roof of the infra-orbital foramen, and I believe that narrowing of the canal and pressure on the nerve was the cause of the trouble in this case. Having isolated the nerve from the infra-orbital artery, I divided the latter between two ligatures, cut the nerve as close to the skin as possible, and then divided it at the spheno-maxillary fissure. As I believed that the disease was localised in the orbital part of the nerve, I did not attempt to remove Meckel's ganglion. The patient was entirely relieved from neuralgia, and suffered practically no inconvenience from the operation wound; the latter was soundly healed in ten days, and he returned to his home on the 23rd of August. I received a letter from him a few days ago, five months after the operation. He has not had the slightest return of the pain, though, as one would naturally expect, "the lip still feels numb," as the patient expresses it. With regard to the question of removing Meckel's ganglion, I extract the following statistics (collected by Dr. Fowler, of Brooklyn) from Professor Rose's book:—Dr. Fowler found that in 26 cases where the ganglion was removed, the average period of relief was one year five months and sixteen days; while in 26 cases in which the ganglion was left *in situ*, the average period was one year three months and fifteen days. Thus, there is an average gain of two months in removing the ganglion. It appears to me that this gain of two months does not offer sufficient inducement to lead us to adopt removal of Meckel's ganglion as a routine measure in this class of operation. In my own case the operation was practically bloodless, as I did not go beyond the spheno-maxillary fissure; but it is probable that troublesome hæmorrhage would be the rule in dealing with Meckel's ganglion.

This ganglion lies in the spheno-maxlliary fossa, surrounded by large and closely-packed branches of the internal maxillary artery, which would be difficult to avoid and more difficult to secure. After quoting Dr. Fowler's statistics, Professor Rose says:—"I fear it must be admitted that all operations for the relief of tic of the second division of the fifth nerve are unsatisfactory." Now, if we consider how severe the pain of epileptiform neuralgia is, and how it renders the life of the sufferer almost unbearable, I think, if the average immunity were a year (or even nine months) instead of a year and three months, that the operation would be well worth performing, as we can perform it with practically no danger or after-inconvenience to the patient, and get the wound completely healed in three days, as in Mr. Stoker's case, or in ten days, as in my own. But I believe that such an operation is of more value than even temporarily relieving the patient. It gives him confidence in the power of surgery to remove the cause of his sufferings, and prepares him for a more radical operation. Prof. Horsley says that patients who have been treated by neurectomy will scarcely listen to the suggestion of any other form of treatment when the disease recurs. Mr. Stoker has said that the operation for removal of the Gasserian ganglion is on its trial; I venture to say that I believe a very brilliant future awaits this operation. Professor Rose has extirpated the Gasserian ganglion five times with complete relief of the pain; in the sixth case the patient died of septic poisoning, the source of contamination being apparently the Eustachian tube, which was accidentally opened during the operation. This source of danger can be avoided in future. No doubt this success is largely due to the skill and experience of the operator himself, but even after allowing due weight for Professor Rose's personality, I think that these six cases are a remarkable record for a novel operation of such difficulty and magnitude. There has not been any return of the pain in any of the five patients who have survived the operation. The dates of these five operations are as follows:—April 2nd, 1890; January 29th, 1891; October 29th, 1891; November 5th, 1891; January 16th, 1892. I confess that I have a predilection in favour of the operation, as so many anatomical points are involved in it, and I hope that by allusions to it I may succeed, better than I have hitherto been able to do, in making the students in the dissecting-room of Trinity College interested in the anatomy of the pterygo-maxillary region and middle cranial fossa. Among the many points of interest I

will mention only one—the relation of the Gasserian ganglion to the cavernous sinus. It is stated both by Thiersch and Horsley that removal of the anterior or ophthalmic portion of the ganglion is impossible without laceration of the sinus. I entirely agree with this statement, as I have studied this region not only by a great number of dissections during the last eight years, but also by means of coronal frozen sections passing through the (injected) sinus. Professor Rose, however, says:—"Recent investigations have convinced me that on the cadaver, at least, it can be accomplished, though not without some difficulty." Whether the anterior portion of the ganglion can be removed or not, it is questionable if such a proceeding is desirable. It is probable, as Professor Rose observes, that the trophic centres for the eyeball are situated in this part of the ganglion. In Professor Rose's first case, the superior maxillary bone was excised and the eye was lost. In the four next cases, in which the operation was conducted through the pterygoid region, the eye required careful watching for a time, but remained either unimpaired or "subject to slight occasional pain and intolerance of light." In the sixth case, in which the operation was conducted in a similar manner, it was found (*post-mortem*) that "the posterior half of the ganglion had been completely removed, the anterior half being surrounded by cloudy blood-stained serum;" hence we may infer that in the four preceding operations more or less of the anterior half of the ganglion was left *in situ*, and I think it probable that the integrity of the eye was largely due to the preservation of this portion of the ganglionic substance.

Mr. Franks did not think, in stretching a nerve, it made much difference whether the nerve was sensory alone or sensory and motor mixed. He had seen great benefit from stretching the sciatic nerve in the manner introduced by Billroth.

Mr. Stoker, in reply, said he was greatly indebted for those interesting remarks. He admitted the importance of diagnosticating accurately, but he did not think the situation of pain a definite indication of the portion of nerve engaged. He did not think there was any danger in removing the nerve behind the spheno-palatine ganglion. He did not think that Mr. Rose contended that he had removed the entire Cæsarean ganglion, which, as it was done bit by bit, was impossible to tell.

SOME MODIFICATIONS OF LISTON'S LONG SPLINT AND LEG SIDE SPLINTS, WITH CRADLE FOR SWINGING.

By HERCULES MacDONNELL, M.Ch., M.D. Univ. Dubl.;
Surgeon to the County Infirmary, Dundalk.

[Read in the Section of Surgery, January 20, 1893.]

I FEEL that an apology is almost due this Section for introducing to your notice this evening such trivial matter as slight modifications in leg and thigh splints. Yet for practical surgeons any adaptation which gives increased security and decreases discomfort is not unworthy of consideration.

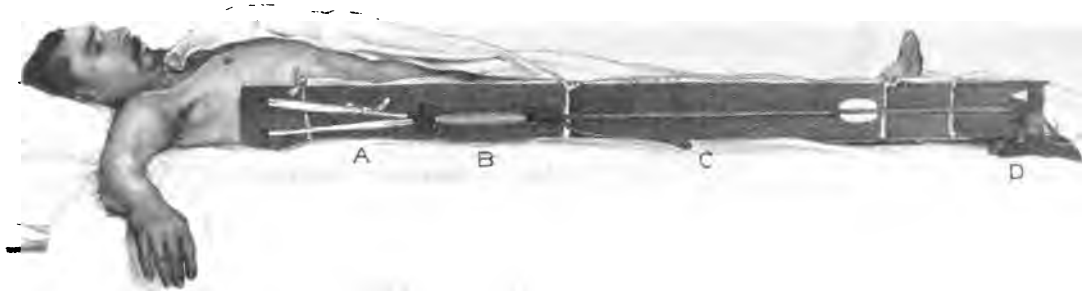
I will first deal with some alterations in Liston's long splint.

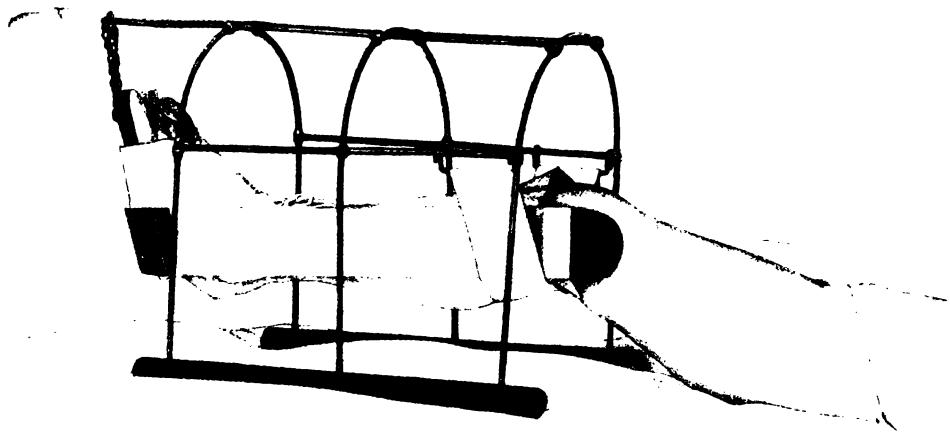
The main object in treating fractures of the thigh is that extension and counter-extension are not perfectly complementary; when rigidity is secured, it is distressing to the patient either by undue pressure on the perinæum or an unnecessary amount of extension from the ankle; whatever method of extension obtains, the perinæum offers the resisting power to extension, and this of a non-elastic, rigid character. No doubt, springs and complicated interrupters have been devised, but they are not reliable or simple in their action. For the past ten years I have been in the habit of using, both in hospital and private practice, Liston's long splint with one or two modifications, which I shall proceed to describe.

Just above the forked end of the splint I have had a round hole bored about half an inch in diameter; let into this is a brass thimble. The perinæal lac is made by sewing the usual pad along the middle portion of a strong linen web tape about five feet in length and one inch broad.

The chief modification consists of an India-rubber interrupter. These are made of solid India-rubber, varying in thickness and length, according to the elasticity required, and having a brass thimble, such as sail-makers use, lashed into either end. The interrupter most frequently required is seven-eighths of an inch in diameter and six inches in length; it requires an extending force of 14 lbs. to stretch it one inch. The splint is applied in the ordinary way. Extension is made from a plaster stirrup extending two inches below the sole of the foot. Into the loop is placed a block of wood, with a hole bored through the centre and rounded at the sides, so as not to cut the stirrup. The block should be the full breadth of the foot to take all pressure off the ankle. A stout piece of sash-line, with a knot at one end, is passed through the block and out through the eyelet at the forked end of the splint. This is carried up to the interrupter and through the eyelet at its lower end. The ends of the perinæal band are brought through the holes in the upper end of the splint; one is passed through the upper eyelet of the interrupter and fastened by a sheet bend or reef knot to the other end of the perinæal band. The fracture can then be reduced either in the ordinary way or by traction on the extension rope. In a few minutes the elasticity of the rubber overcomes muscular resistance, and nothing remains but to take off some of the extending force, fasten the rope, and put a bandage round the limb, leaving the lac, the interrupter, and the extension rope outside the bandage for future convenience. The result is eminently satisfactory. An endless elastic circuit is formed. The force is equally divided between extension and counter-extension; should either the rope or lac stretch, or in any way get slack, the India-rubber interrupter takes it up, and equilibrium is restored.

With properly made lacs, there is no danger of cutting





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DR H. Mc DONNELL ON SPLINTS.

EXPLANATION OF PLATES.

A Perinæal lac, brought through splint at top and through eyelet in India-rubber interrupter.

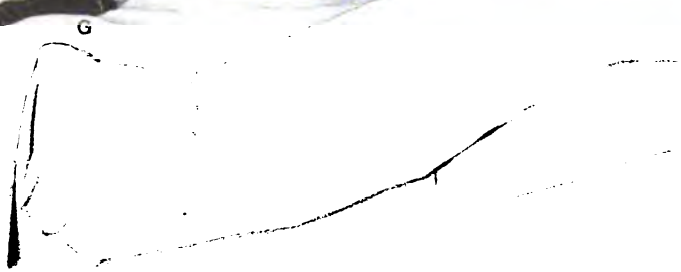
B India-rubber interrupter, with eyelets at both ends.

C Extension rope, from plaster stirrup, passed through D (brass-mounted hole in splint), and rove through lower eyelet in India-rubber interrupter.

E Plaster stirrup.

F Extension rope.

G Cross rest, with splint resting in it.



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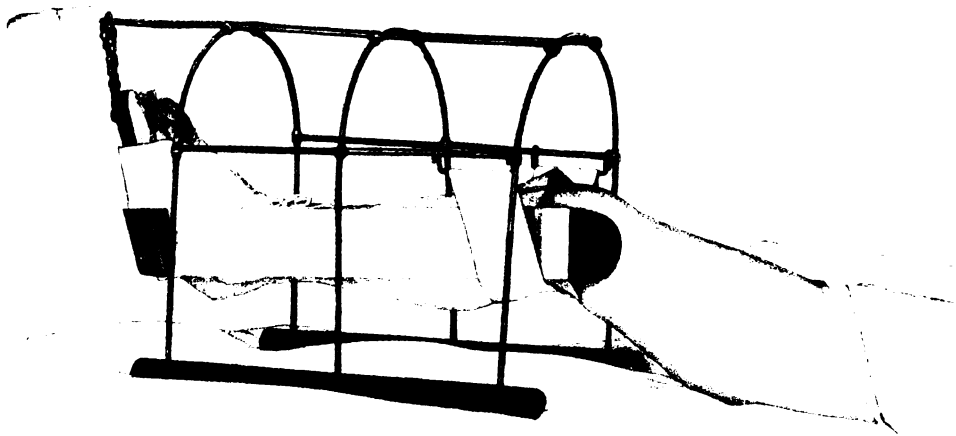
DR H. MC DONNELL ON SPLINTS.



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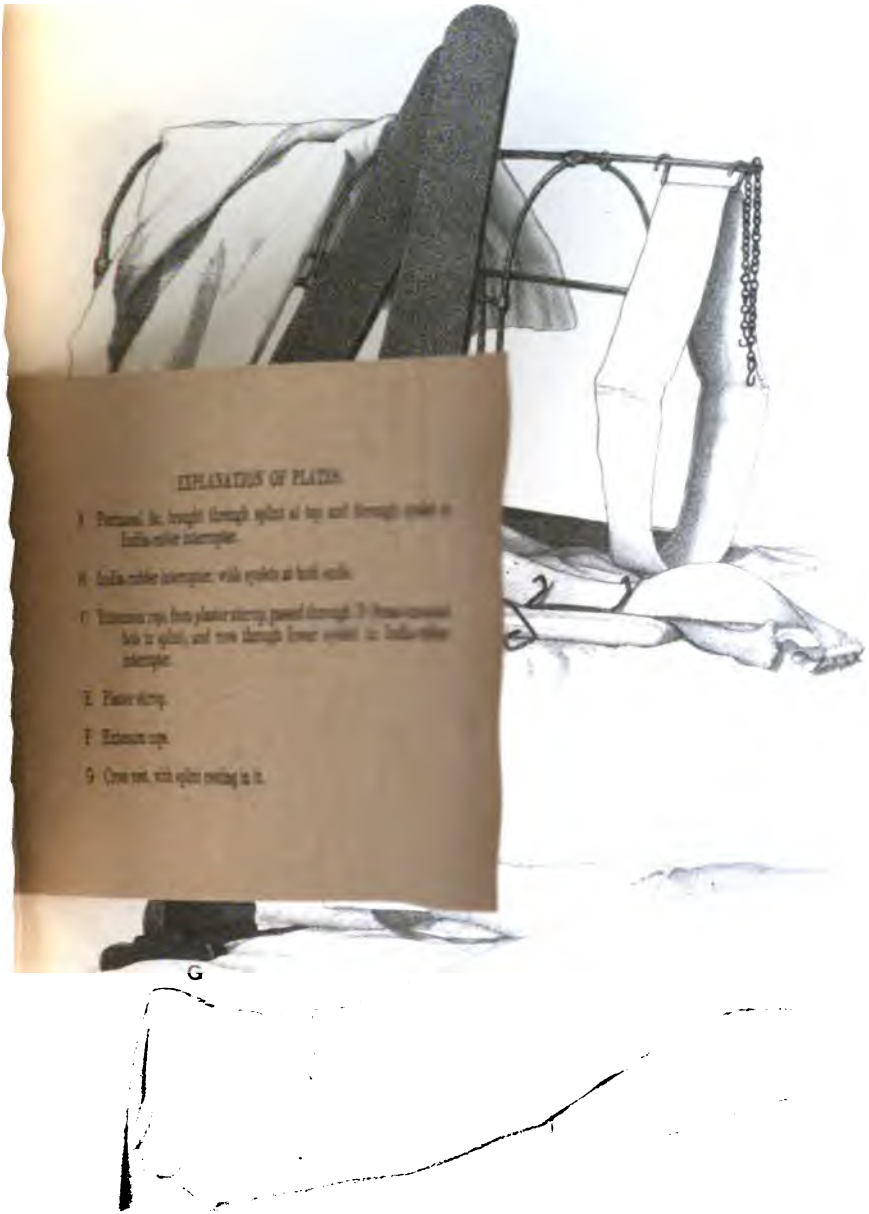
DR H. Mc DONNELL ON SPLINTS.



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DR H. Mc DONNELL ON SPLINTS.

scalding, or chaffing the perinæum. To raise the heel slightly off the bed, and keep the splint vertical, I use a simple rest. It is made of wood an inch thick, about eight inches long, and five inches high; a slot the thickness of the long splint is cut out of it, a little more than one-third across it, not in the middle. When the splint is in the slot it raises the heel half an inch off the bed. The reason the slot is not cut in the middle is to have a longer lever on one side of the rest to counteract the tendency to inversion or eversion, the long arm of the rest being turned as occasion requires.

The leg splint I wish to bring before your notice is a modification of one frequently used when I was a student in the City of Dublin Hospital. It consists of two wooden side splints pierced at the lower end to permit two bolts to traverse a foot plate, thus keeping the side splints firm and the foot plate in position. Formerly this was accomplished with fine threaded bolts and nuts, the bolts passing through two brass eyelets screwed into the back of the foot plate, this being at a right angle.

The apparatus was not very secure, and the position of the foot was irksome.

In addition to the side splints and foot plate the apparatus consists of a piece of calico the length of the splint and once and a half as broad, with the necessary pads.

The modifications I have adopted are as follows:—Instead of the foot plate being vertical, it slopes slightly; this gives increased comfort. Instead of eyelets on the back of the foot plate, the foot plate is perforated from side to side to take the bolts. Instead of nuts to fasten the bolts, thin brass plates an inch and a half broad are let into the outside of the lower end of the side splints; one of these plates has two female screws. The bolts are made with a long pitch in the thread to work quickly, each revolution of the bolt approximating the side splints half an inch.

The mode of application is extremely simple. The fractured leg is placed over the centre of the piece of calico. Each side splint is laid along the leg in the position it is intended to occupy, then rolled over backwards till the edge of the calico is reached; this is tucked over the edge of the splint, which is rolled back again to the leg, this time covered with the calico; a pad is placed next the limb. The other splint is similarly put in position. The foot plate, with its pad, is placed against the sole, the two bolts run through all, and screwed up to the necessary tightness. A figure-of-eight bandage is placed round the instep and over the ankle. A strap and buckle is placed loosely just below the knees. The fracture can then be reduced, and on tightening the strap perfect immobility is obtained. I find wheaten straw in calico the coolest pads. The main advantages of this splint are its perfect adaptability to any sized leg; pressure being lateral and controlled by the screw bolts, the side splints with the calico underneath act as a sling to the leg; the calf moulds the calico to fit it accurately, and the heel does not bear on anything; the entire front of the leg is uncovered, and the slightest displacement can be readily detected.

Compound fractures can be treated with great convenience, as each side splint can be rolled back while the other remains in position, dressings and pads can be replaced, and, with a little care, the calico changed, though this is seldom necessary if a piece of waterproofing, covered with finely teazed oakum or tenax, be placed over the calico and next the limb. To insure complete comfort it is necessary to swing the leg. I have had cradles made of a very inexpensive and simple nature. They are composed of two wooden bearers, with three round galvanised iron wire hoops, three-sixteenths of an inch thick, the top of the cradle being about 18 inches high. Half way up these hoops are bound together

by a single wire of equal thickness, soldered to each separately. Another wire runs along the top half over the curve, and projects some four or five inches, being turned back on itself to form the corresponding stay on the other side; these form a sort of outrigger, meeting at the projected end. The foot plate has a brass eyelet screwed into it, and a thin chain slings the foot plate to any desired height from the end of the outrigger of the cradle. An endless band of calico 2½ or 3 inches broad is folded on itself and passed under the splint below the knees; this is secured to the side stays on the cradle by two pieces of light rod iron wire clips made with the width of the calico sling, turned up at a right angle to the bearing bar, and bent backwards at the extremity to catch the side stay of the cradle.

Nothing can be simpler than this method of slinging. It is firm. The limb can be raised or lowered to any height, and no part of the limb rests on any unyielding substance. I have treated some hundreds of simple and compound fractures by this method with satisfactory results, and have never heard a patient complain of that bane—a sore heel.

Mr. Thomson said that he preferred the simpler and less expensive plaster splint to any elaborate appliance.

Mr. Lentaigne coincided with Mr. Thomson in condemning the box splint.

Dr. MacDonnell, in reply, admitted the efficiency of the plaster splint, but said that cases arose in which it could not be applied.

CANCER OF THE RECTUM.

By CHARLES B. BALL, M.Ch., F.R.C.S.;
Surgeon, Sir Patrick Dun's and Simpson's Hospitals;
University Examiner in Surgery.

[Read in the Section of Surgery, December 9, 1892.]

MALIGNANT NEOPLASMS OF THE RECTUM AND ANUS.

Of the various new growths which are found in the rectum, and which are clinically malignant, cylinder-celled epithelioma, or, as it is sometimes called, "malignant infiltrating adenoma," is unquestionably the most common.

Subsequently I purpose discussing, as far as is at present possible, the pathological differences between the various forms of rectal tumour exhibiting malignancy; but as it is sometimes quite impossible to differentiate these varieties *clinically*, it will be convenient to retain the term "cancer," using it in its broadest sense, as synonymous with all the forms of malignant tumour, whether histologically of epithelial or connective tissue origin. It is not necessary here to discuss the vague and speculative theories which have from time to time been put forward to explain the ætiology of cancer. Much has been written and said upon this subject, but nothing definite has been arrived at; and it still remains an inscrutable mystery why it is that tissue in all respects apparently identical with normal epithelial structure should overstep its natural limits of growth and development; extend widely into neighbouring regions; appear as metastatic growths in other situations; break down and suppurate as a result of excessive and exuberant growth; recur after wide removal; and, lastly, produce that constitutional disturbance and rapidly-progressing marasmus known as the cancerous cachexia.

In order to arrive at some idea as to the frequency of rectal cancer, both relatively to the examples of the same disease in other parts of the body, and more particularly in other parts of the intestinal tract, it becomes necessary to refer to considerable statistics. It is, however, quite useless to collect for this purpose a simple record of cases published in periodical literature, the returns of large hospitals alone affording reliable information. Leichtenstern[a] has carefully collated the following figures from the returns of the K. K. Allgem. Krankenhaus at Vienna. Out of 34,523 deaths at the hospital between the years 1858 and 1870 were 1,874 cancers of different kinds, equal to 5·4 per cent.; and of 4,567 cancers at the same hospital, 143 were of the rectum, and 35 of other parts of the intestines; the former were therefore 3 per cent., the latter 0·76 per cent. of the whole, and the former 80 cent., and the latter 20 per cent. of all cancers of the intestines. Mr. W. R. Williams[b] has collected a large series of equally reliable statistics from the Middlesex Hospital, St. Bartholomew's Hospital, St. Thomas's Hospital, and University College Hospital. Out of 5,556 cases, he gives the following table, showing the frequency in some of the more important organs:—

	Male	Female	Total
Breast	13	1,310	1,323
Uterus	—	1,160	1,160
Tongue	384	64	448
Rectum	130	127	257
Skin of face and neck, including rodent ulcer	161	89	250
External genitals	126	102	228
Lip	221	2	223
Intestines, &c.	23	26	49

[a] Ziemssen's Cyclopædia of Medicine. Vol. VII., p. 635.

[b] Lancet. May 24, 1884.

It will be seen from this table that the results obtained at the London general hospitals are practically the same as those observed at Vienna. Referring to the records of the Brompton Cancer Hospital, as given by Jessett,[a] we find that out of a total of 1,908 cases of cancer admitted, 58 were suffering from cancer of the rectum, or slightly more than 3 per cent. One would expect that a slightly smaller proportion of rectal cases would present themselves at this special hospital; because persons suffering from cancer of the rectum would be more likely to apply to a general hospital, under the impression that it was some other form of disease that they were suffering from; whereas, persons suffering from some of the other and more easily recognisable forms of cutaneous cancer would gravitate to the Brompton Hospital. It may, therefore, be taken as sufficiently accurate that in 3·5 per cent. of all cases of cancer the disease is situated in the rectum; and in 80 per cent. of cases of intestinal cancer the disease is located in the lower bowel. In the records of St. Mark's Hospital, as given by Allingham,[b] out of 4,000 cases of rectal disease, 105 were examples of cancer.

The degree in which apparently similar forms of carcinoma exhibit the clinical features of malignancy varies notoriously with the situation in which the disease develops. Thus, for instance, epithelioma of the tongue is extremely malignant; whereas, the same disease situated upon the lip is, at any rate in the early stages, one of the most benign of the unequivocal epitheliomata; similarly, epithelioma on the scrotum is very much more satisfactory to deal with than the same disease when occurring on the penis. Compared with other regions of the body, it would appear that the rectum is one in which the average intensity of the malig-

[a] Cancer of the Alimentary Tract. P. 238. London. 1886.

[b] Loc. cit.

nancy is not very great, the disease for a long time not passing the limits of the intestinal wall. Allingham, whose experience on this subject is so extensive, puts the average duration down at two years, the most rapid terminating fatally within four months of the earliest symptom of its invasion; while the longest duration noticed by him was four years and a half. It is, however, quite impossible to estimate accurately the duration of this disease, as the symptoms during the early stages are so slight that they may be scarcely sufficient to attract the attention of the patient. This will be a matter of familiar observation to all surgeons. It not unfrequently happens that a patient comes to us complaining of some slight diarrhœa or other mild rectal trouble, and an examination unexpectedly reveals the fact that he is the victim of cancer so very extensive that it must have obviously existed for a very considerable period. And, again, the life of the patient is not unfrequently sacrificed by the accidental complications of the disease, such as intestinal obstruction, or involvement of the bladder, rather than by the progressive marasmus, which is the usual mode of termination of cancer of other regions.

Some authors state that as the result of their experience a greater number of males suffer from rectal carcinoma, while others assert that the opposite is the case. The large statistics of Williams, however, show that there is extremely little difference in the relative frequency. Out of 257 cases, there were 130 males and 127 females.

Although essentially a disease of middle life and old age, rectal cancer has been met with several times under the age of 20 years. The earliest age that I have seen recorded is that noticed by Allingham[a] as having occurred in the practice of Mr. Gowland at St. Mark's Hospital, in which a boy not 13 years of age suffered from cancer of the rectum;

[a] Loc. cit. P. 270.

while Allingham gives a case of his own in which a boy of 17 years died of what is described as encephaloid of the rectum. Considering the vagueness of the term encephaloid and the frequency with which it is applied to rapidly growing tumours of the sarcoma type, it appears possible in the absence of detailed microscopic examination that this tumour was sarcomatous, and it is well known that tumours of that type are not very uncommon in early life. A case of cancer is recorded by Godin[a] at 15 years, Quain one at 16 years, and Cripps one at 17 years. Schœning[b] describes two cases as occurring at the Rostock clinic. In the first, a girl, aged 17, presented typical symptoms of rectal cancer. She was stated to have suffered from rectal prolapse at the age of 7, and the more severe symptoms began to manifest themselves at the age of 16 years. The tumour was excised, and presented the microscopic characters of undoubted carcinoma. The disease recurred and proved fatal in two months. The writer concludes that she suffered from adenoma at the age of 7 years, which subsequently began to infiltrate and become malignant. In the second case, a girl, of 17, presented herself with a tumour the size of a fist, very hard, and encroaching on the pelvic organs, and affecting the inguinal glands. As the tumour could not be removed, the constricting tissues were divided. A portion removed proved the tumour to be an alveolar, cylinder-celled carcinoma partly undergoing cystic degeneration.

THE PATHOLOGY OF MALIGNANT NEOPLASMS OF THE RECTUM AND ANUS.

The older method of classification of tumours into benign and malignant, although of great practical utility, was soon found to be insufficient; for although the difference between

[a] Quoted by Mollière.

[b] Deutsch. Zeitschrift f. Chirurg. Bd. 22, Hft. 1 and 2. 1885.

PLATE I.—(*See* page 169.)
From micro-photograph of margin of cancerous noduli (× 10 diameter).
A. Normal mucous membrane.
B. Infiltration of muscular structure by glandular tissue.

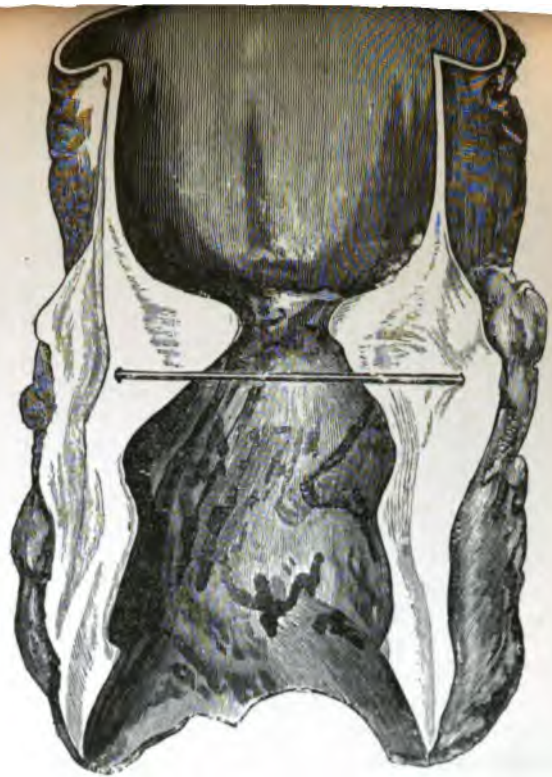

PLATE II.—(*See* page 180).
Case of colloid cancer of rectum, natural size, removed by trans-sacral incision.

typical varieties was sufficiently obvious, cases were met with on the borderland between the two which it was impossible to refer to either with certainty, and for these the class of semi-malignant tumours was introduced. Since the clinical classification has given place to the histological, it does not appear that the exact limitation of the groups is thereby rendered, in some instances, more definite, and this is notably the case in cancer of the rectum. The clinical differences between the simple adenoma, or mucous polypus, of the rectum, and cancer of that organ, are sufficiently obvious: the simple adenoma generally occurring in young persons; being attached to a long pedicle; not tending to recur after removal; or to affect the constitution: the cancer, on the other hand, is sessile; tends to infiltrate deeper parts; to break down and ulcerate; to profoundly affect the constitution; to recur after removal, and produce metastatic growths of similar character at a distance from the original site. Now when these growths are examined under the microscope they both consist essentially of the same tissue—namely, the glandular structure of the mucous membrane, such as is normally found lining the Lieberkühn follicles of the intestine; the only difference being that in the benign form there is a tendency to project into the lumen of the bowel, and to draw down a pedicle of *normal* mucous membrane, while in the cancer the wall of the intestine is from the very first infiltrated with the new formation. First the muscularis mucosæ becomes perforated, then the submucosa invaded, and subsequently the muscular coat itself is infiltrated (*see* Plate I.), so that the only histological difference between these growths is really one of situation, and of relation to surrounding tissues, not of structure.

As might be expected, cases are occasionally seen in which it is impossible to say to which class, whether adenoma or adeno-carcinoma, the growth should be referred; so that

histologically as well as clinically the limits of classification are not very distinct. As the carcinomata originating in any structure are principally composed of the epithelial elements similar to those normally present in the immediate vicinity, it follows that those commencing in the intestinal mucous membrane should consist principally of adenoid tissue, and such has been found to be the case. Mr. Harrison Cripps, whose investigations of the histology of rectal cancer have been extremely extensive, embracing a careful investigation of sixty separate examples of the disease, says: "In the rectum I have failed to discover any growths or tumours which pathologists designate as scirrhous or medullary cancers, or as belonging to the different varieties of sarcoma. Considering the eminence of many careful observers who have applied such names to these growths, it would be quite unjustifiable to assume that such distinctive structures never form the entire bulk of the tumour; but I feel bound to state that, with perhaps a more than average opportunity of examining such growths from the rectum, I have been myself unable to discover tumours composed entirely of the distinctive features appertaining to these diseases."[a] Mr. Treves[b] expresses a somewhat similar opinion, that the form of cancer found throughout the entire intestinal tract is cylinder-celled epithelium, and he quotes from a monograph by M. Haussmann,[c] who says:—"We will give, then, cancer of the intestine the following definition: cancer of the intestine is cylindrical epithelioma of that organ." Putting aside for the present the question of sarcoma, the occurrence of which in the rectum is undoubted (and of which I have had an instance in my own practice), let us consider what is meant by the terms scirrhous and

[a] Diseases of the Rectum and Anus. P. 317. 1884.

[b] Intestinal Obstruction. P. 268.

[c] Thèse de Paris. No. 228. 1882.

medullary cancers at the present day. If the former is taken only to indicate that in which, with the epithelial development, there is a very considerable hyperplasia of the connective tissue, forming firm and hard masses of tissue, the so-called stroma, which frequently manifest a tendency to contract and pucker the invaded tissue, then, without question, scirrhous cancer does occur in the rectum. Similarly, if medullary cancer or encephaloid is taken to mean that the tumour is of rapid growth, soft structure, and that the epithelial cells are more or less embryonic in character, and the connective tissue ill developed, then this form of tumour is also present in the rectum. But if, on the contrary, these terms are taken to represent distinct types of carcinoma, the epithelial elements of which essentially differ from those found in the organ or tissue in which the carcinoma originates, then not only are these forms not to be found in the intestine, but they cease to have an existence in any other part of the body. As, however, these terms have been used with much vagueness, it is better to dispense with them altogether. All observers appear to be agreed that at any rate by far the most common form of intestinal cancer is the columnar-celled epithelioma, or adeno-carcinoma, or infiltrating adenoma, as it is variously termed. The term cylindroma, which has been frequently used as a synonym for this disease, is misleading in the extreme, having been introduced by Billroth for a special form of tumour quite unconnected with this form of cancer.

When cancer primarily attacks the anus, as might be expected, the bulk of the tumour is composed of scaly epithelium, and the growth resembles that met with in the lip. Cripps has, however, stated that when a cancer, originating in the interior of the rectum, and of the adeno-carcinomatous variety, invades the anus, the character of the epithelial

cells varies, and comes to resemble the ordinary scaly type. This is remarkable, as the metastatic reproductions of intestinal cancer in other organs correspond very accurately to the original histological character of the growth; as, for instance, the multiple tubercles in the liver, which are such a common sequela to rectal cancer, when examined under the microscope present the same follicular structure so characteristic of adeno-carcinoma. My colleague, Dr. Purser, has given me a section of a tumour in the lung, secondary to a carcinoma of the sigmoid flexure, and in it the reproduction of the original character of the tumour was most marked, little masses of epithelial cells closely resembling Lieberkühn crypts being surrounded by normal lung tissue.

There is some considerable variation in the macroscopic characters presented by adeno-carcinoma when present in the rectum; these differences being chiefly influenced by the rate of growth, and the direction in which the tumour principally extends. These varieties have been distinguished by Cripps as the "tuberous," "laminar," and "annular."

The *tuberous adeno-carcinoma* presents itself as a considerable-sized mass projecting into the lumen of the bowel, obviously implicating the mucosa, which can be traced into it, but not moved freely over it. Associated with it may be other smaller masses. It is not necessarily very hard to the touch, and, in the early stages, does not extend beyond the limit of the rectal wall, as is demonstrated clinically by the free mobility of that organ in the pelvis. This form tends to ulcerate very rapidly; first the mucous membrane on the surface necroses; then the centre of the mass breaks down, exposing the muscular layer of the intestine, and leaving a crater-like cavity surrounded by the infiltrated mucosa and submucosa; at last the intestinal wall is perforated, and the pelvis becomes invaded, the bladder or urethra may be opened, the vagina ulcerated into, or the nerves of the sacral

plexus involved in the neoplasm, or even the bony wall of the pelvis may become implicated. This variety may be taken as the type of the more rapidly growing adeno-carcinomata. It is the form most frequently met with in younger subjects. It may produce obstruction by the bulk of the growth, but does not usually do so by producing contraction of the intestinal wall, as the other and more chronic forms do. This no doubt is the variety alluded to by most of the older writers under the head of medullary or encephaloid cancer; though in all probability the same term was applied to some of the sarcomata, which from rapid growth and large tumour formation resemble closely the tuberous adeno-carcinomata in their clinical aspects.

The Laminar Form.—This, according to the investigations of Mr. Harrison Cripps, is the commonest variety. It occurs as a layer of adenoid growth spreading laterally in the submucosa, of a thickness of about a quarter of an inch or less, while the area over which it extends may be considerable. It has a tendency rather to extend laterally than vertically, so that in time the entire circumference of the gut may be involved. Although principally situated in the submucosa, it is obvious that the mucous membrane is attached to, and incorporated with, the growth; and in the same way, the muscular tunic of the intestine is adherent to the tumour deeply. As the tumour advances in growth there is a considerable development of connective tissue in the outer walls of the intestinal tube, which subsequently undergo contraction, producing the puckering and cicatricial constrictions which have given origin to the use of the word scirrhous in connection with this disease. As in the former variety, ulceration of the mucosa soon occurs; which may be followed by perforation of the rectal wall into any portion of the genito-urinary system; or at other times the new formation will be more rapid than the ulcerative action, and the

result will be the spreading of a fungating mass into the rectum.

The annular form is that in which the neoplasm surrounds the rectal tube without extending vertically to any great degree. It would appear to be one of the most chronic forms, and naturally attended with much contraction, forming the true "malignant stricture."

Besides the infiltration of surrounding structures, rectal adeno-carcinoma tends to reproduce itself in other parts of the body; and like all the group of the carcinomata, the lymphatic glands become implicated with extreme frequency. When, as is usually the case, the disease is situated entirely within the rectum, leaving the anus free, the first to be involved will be the pelvic and lumbar glands; and sometimes these are seen to be of very large size, the glands along the iliac vessels being sometimes quite as large as hen's eggs, and capable of recognition during life by abdominal palpation. Next in order, the lumbar glands are enlarged; but the lymphatics of the groin only become implicated as a consequence of involvement of the external skin of the anus, or when in an advanced stage of the disease a very widespread lymphatic implication follows the primary enlargement of the pelvic glands in cases of adeno-carcinoma. Next in frequency to the lymphatic system, the new growths are liable to be found in the liver, probably the most frequent cause of disseminated hepatic cancer being the form of disease under consideration. As is usual with metastatic tumours, the secondary growths reproduce with singular exactness the histological characters of the original tumour. Involvement of the peritoneum also is not unfrequent, the metastatic growths appearing like grains of boiled sago over the surface, and matting together, when extensive, the coils of small intestine. Secondary deposits have also been found in the pancreas, lungs, &c.

The essential histological characteristic of adeno-carcinoma is the fact that in this disease the adenoid tissue perforates the muscularis mucosæ, and develops in the submucosa and muscular coat (Fig 1). It is this characteristic alone which serves to establish the accurate diagnosis between the

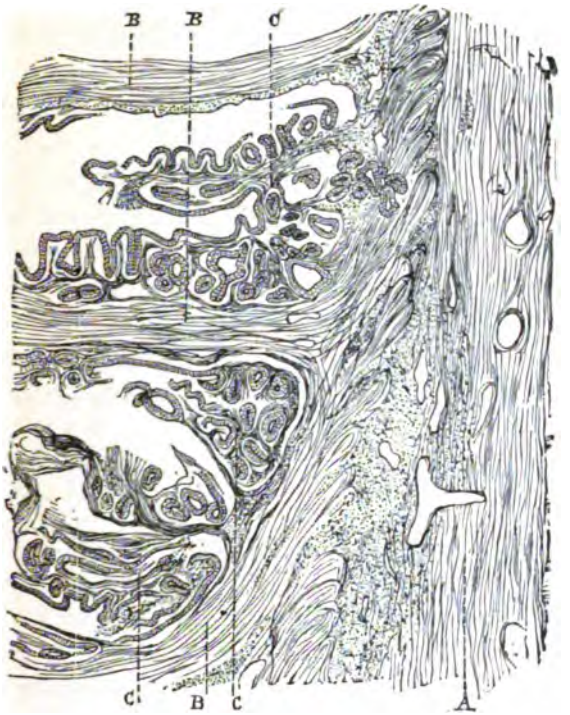

Fig. 1.—Cylinder-celled Epithelioma of Rectum (× 10 diameters).]
A, External muscular coat of bowel; B, internal muscular coat of bowel; C, masses of adenoid tissue separating the bundles of muscular fibre of the internal muscular coat.

malignant and non-malignant forms of adenoma, and in this respect the case is exactly analogous to difference between a wart and an epithelioma on the skin proper. In fact, the essential element in the production of a carcinoma is the development of epithelium beyond its natural superficial

limits. For fuller detail of the histology of rectal cancer the reader must be referred to the work of Mr. Cripps.* It is, of course, seldom that the very earliest stage of rectal carcinoma can be investigated, as no important symptoms are usually produced until the disease has made considerable progress, so that it is impossible to state what the initial change is. Cohnheim has propounded a very ingenious theory, by which he attributes an embryonic origin to all tumours, and considers that an embryonic rudiment is left during development, and that at some later period this may undergo proliferation. He bases one of his arguments in support of this theory on the frequency with which cancer occurs at the places where, during development, diverse epithelial formations pass one into another, as the lips, rectum, stomach, cervix uteri. Certainly the fact that, in a large majority of cases, rectal cancer commences at a place corresponding closely to the site of junction of the procto-dæum and mesenteron would appear to favour this view.

In order to investigate the method of growth, it is necessary to examine the spreading margin of the tumour; that which projects into the rectal lumen being the most suitable for demonstrating the mode of growth, the deeper parts being altered by the way in which the neoplasm is disseminated between the normal structures, and mixed with the débris of atrophic tissues. The central parts are also unsuited for minute examination, as fatty degeneration and breaking down of the tissues is usually taking place there. If the spreading margin be examined, it will be found that it is raised above the level of the adjacent membrane, and sometimes overhangs it to some extent, but it will always be found to be attached by a broad base, and incorporated with the structures forming the rectal wall; it is, however, never distinctly pedunculated as in the case of the simple adenoid

* Loc. cit. P. 308.

growth. It is quite true that we sometimes find small pedunculated adenomata in the rectum in conjunction with adeno-carcinoma, but they usually appear as if they were due simply to the irritation of the discharge from the cancer. Figure 2 represents a section of a simple adenoma, which existed in conjunction with undoubted cancer (from a specimen kindly given me by Dr. Patteson). And although a few

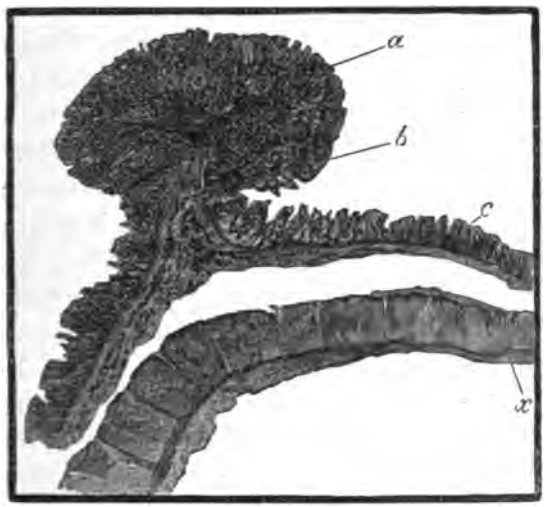

Fig. 2—Adenoma of Rectum from Case of Rectal Cancer (× 12 diameters). *a*, Glandular structure; *b*, connective tissue and muscularis mucosæ; *c*, healthy mucous membrane; *x*, muscular coat of bowel.

cases are recorded in which a malignant form of disease has followed the removal of a simple adenoma, yet they are so rare that the rule may be adopted, that pedunculation is a very strong argument against malignancy. According to Cripps, if the surface of a growing margin be examined with a low microscopic power, it will appear like "an ant-hill thickly studded with fungi. Upon closer inspection these bodies are seen to be projections from the surface of the tumour." Upon making sections, the Lieberkühn follicles are found much increased in size, being three or

four times longer than normal, while the individual cells are also much increased in length, sometimes being ten times longer—*i.e.*, one-hundredth of an inch. The follicles may be lined by a single layer of columnar epithelium, only leaving a central cavity. In other instances the central cavity is absent either by approximation of its walls, or by a growth of offshoots from the epithelial walls. These offshoots consist of a central stroma of retiform tissue, upon which a bipinniform arrangement of cylinder-cells is seen to fill up completely the cavity. The question arises whether these cavities are shut sacs, or only cross-sections of convoluted tubes of dilated Lieberkühn crypts. Cripps appears now to take the latter view. Where the sections are taken from very rapidly growing and soft tumours, it will be found that the typical cylinder cells will not be formed, the whole aspect being more embryonic in character; the cells being rounder and less defined, the way in which they are disposed, and the tendency to follicular formation, however, leave no doubt of their connection with the adeno-carcinomata.

Colloid or Gelatinous Cancer.—The writings of Cruveilhier[a] have been frequently quoted as showing that this form is the most frequently met with in the intestinal tract. As Cripps, however, justly remarks, an examination of museum specimens does not tend to show that this disease was more common formerly than at present, and certainly an examination of recent specimens tends to indicate that colloid must be considered one of the rarer forms of intestinal cancer. In the reports of cases read before the various pathological societies formerly, the terms were used with much vagueness, and probably applied to very different forms of growth. In the rectum it may occur as a definite tumour or as a diffuse infiltration, and is characterised by the translucency of its substance. The stroma contains, instead of closely packed

[a] Traité d'Anatomie Pathologique Générale. P. 64, et seq.

masses of epithelial cells, a more or less clear jelly. According to Ziegler,[a] "the colloid or gelatinous texture of the tumour is due to mucoid or colloid change affecting the cancer cells. It begins with the formation of clear globules in their interior; the cells then perish, and the globules coalesce with each other and with the larger gelatinous lumps already formed. In this way a large homogeneous mass is ultimately built up. It is not uncommon for all the cells over a wide area to perish in this manner, so that the stroma is the only formed constituent remaining; in other spots cell groups may still be found encircled by colloid masses; in others there is no colloid substance at all."

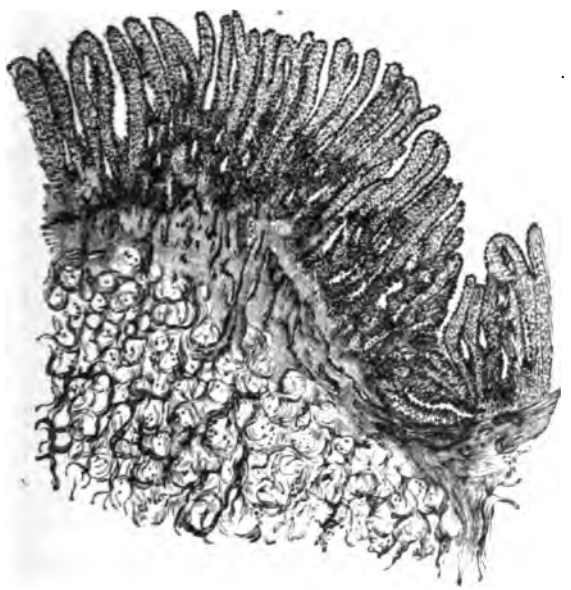

Fig. 3.—Colloid of Rectum (×50), showing perforation of muscularis mucosæ, by new growth.

Some, no doubt, of the gelatinous rectal cancers might be with greater precision designated as *carcinoma myxomatodes*. Professor Purser has kindly given me a very beautiful

[a] Macalister. General Pathological Anatomy. P. 242. London, 1883.

microscopic section of a colloid cancer of the upper part of the rectum, which shows the new growth perforating the muscularis mucosæ, its development in the submucosa, and infiltration and separation of the bundles of the muscular coat. In the greater part of the section nothing but the stroma is left, while in a few places cells containing globules of colloid matter still remain (Fig. 3).

Of colloid cancer I have had two well-marked cases in my practice. The first formed a long tubular stricture about 4 inches long, commencing immediately inside the anus (Plate II.), and the lower portion was much ulcerated, and the intestine above considerably dilated. It was removed from a woman, aged thirty, by trans-sacral incision. She made an excellent recovery, and so far remains free from recurrence.

The second case was that of a man, aged sixty, in whom the disease appeared as a nodule at the upper extremity of a cicatrix, following a very extensive operation for rectal fistula. This was also successfully excised.

The second great class of malignant neoplasms, coming, in order of frequency, after the carcinomata, are those tumours the bulk of which is composed entirely of embryonic connective tissue, but *sarcomata* are rare in the intestinal tract. Mr. Cripps states[a] that he has been unable to find, in his extended examinations of rectal growths, any of the characteristic structure belonging to the different varieties of sarcoma.

In the Museum of the Royal College of Surgeons of Ireland are two very remarkable examples of sarcomatous growths. In the first (Fig. 4) there is projecting from the anus an enormous mass which measures five inches by four; it is much lobulated on the surface, presenting somewhat the appearance of an ordinary papilloma of this region. It differs, however, in this, that the individual lobules are much

[a] Loc. cit. P. 318.

larger, and the intervening depressions much shallower; a small group of secondary growths appears near the scrotum, in the skin of the thigh, and the disease extends up into the rectum for a distance of about two inches. There does not appear, however, to have been any obstruction, as the tube

Fig. 4.—Large Sarcomatous Tumour of Anus and lower part of Rectum, with Secondary Tumours on the inside of the Thigh.*

was quite pervious behind the growth. There is, unfortunately, no very reliable history with this specimen. Dr. P. S. Abraham, the late curator of the museum, kindly undertook a detailed examination, and he made microscopic sections from the mass inside the rectum, from the external growth, and from the secondary formations. In all of them the appearances were practically identical: there was no trace of proliferating mucous membrane; almost the entire of the sections consisting of small spindle cells, with but little fully developed connective tissue.

The second specimen (Fig. 5) is one in which a long tubular rectal stricture exists, commencing about one inch inside the anus, and extending upwards for a distance of five inches. All the coats of the bowel appear to be lost in the growth which surrounds the intestine evenly, and which measures one inch in thickness at the middle portion. Above the neoplasm, the intestine is widely dilated, showing very clearly that during life the degree of obstruction must have been considerable.

* Museum, Royal College of Surgeons in Ireland.

Dr. Abraham has made a careful examination of this specimen also, and the structure appears to be almost identical with the former, and undoubtedly is an example of spindle-celled sarcoma.

These two specimens illustrate remarkably the very different macroscopic appearances which may be produced by tumours of the connective tissue type.

Fig. 5.—Sarcomatous Infiltration of Rectum, producing long tubular stricture.[a]

A well marked case of alveolar sarcoma of the rectum is reported by Billroth.[b] The patient was aged fifty-six, and there was a three years' history of difficult defæcation, the growth prolapsing when the bowels moved; it increased so much in size that it could not be replaced. It extended into the rectum for a distance of 6 cm., and there was a well-marked constriction where it was embraced by the sphincter.

[a] Museum of Royal College of Surgeons in Ireland.

[b] Quoted by Esmarch. Handbuch der allgemeinen und speciellen Chirurgie. Hrsg. v. Billroth. Band III. P. 183. 1882.

There were no enlarged glands or evidence of secondary tumours. The growth was excised, and microscopic examination showed it to be a well-marked example of small-celled alveolar sarcoma.

In connection with Hodgkin's disease, several examples of *lympho-sarcoma* of the intestines have been recorded. In these instances it appears that the tumour originated in the adenoid tissue of the mucosa and in Peyer's patches, and they do not hitherto appear to have produced obstructions or other important symptoms. Dr. Carrington[a] has detailed a case in which a tumour of this kind weighing one and a half pounds, occupied the cæcum without producing symptoms. I have had personal experience of one case in which a tumour, apparently of this nature, was situated lower down in the intestinal canal, and gave rise to rectal obstruction. The patient, an old man of sixty, came under my care in June, 1884, at Sir Patrick Dun's Hospital. He complained of piles and difficulty in getting the bowels to move. Upon making an examination a tumour was felt in the hollow of the sacrum, obstructing the rectum. The mucous membrane was freely movable over it, and the tumour itself was movable in the pelvis. As I thought, from the movability of the mucous membrane over it, that it was outside the intestine, I attempted its removal by linear proctotomy. When reached it was found to be very soft, and it broke down under the finger. As much as possible of it was removed. The patient, however, died of septic periproctitis. At the *post-mortem* it was found that the neoplasm infiltrated and thickened considerably the posterior portion of the muscular wall of the rectum, the new growth in parts above where it was removed being one and a half inches thick. The mucous coat was entirely unaffected, and freely movable over the growth, which appeared to have originated in the

[a] British Medical Journal. Vol. XI., p. 773. 1883.

muscular coat of the bowel. The pelvic and lumbar glands were all very much enlarged, but with this exception there did not appear to be any general disease of the lymphatic system. Microscopic examination was kindly made by Dr. Abraham, who states that it was in all respects similar to the descriptions given of lympho-sarcoma.

Melanotic Sarcoma.—Primary melanotic cancer of the rectum is extremely rare; and according to Virchow this is the only portion of the intestinal tract in which it has been found. Mr. Treves, however, states that there is a specimen of apparently primary melanotic growth arising from the ileum at the London Hospital Museum; and there is an example of melanotic growth in the colon in the Museum of Trinity College, Dublin, but as there were apparently (from the history) similar growths in other parts of the body, it is improbable that the intestinal growth was the primary one. In November, 1884, I brought before the surgical section of the Academy of Medicine in Ireland the following typical case of melanotic sarcoma of the rectum.

The patient, who was sent to me by Dr. J. K. Barton, was admitted into Sir Patrick Dun's Hospital Sept. 16, 1884. She was a tolerably healthy-looking woman, aged sixty years. Eleven months before admission into hospital she first felt a lump coming down when she was at stool, and difficulty in obtaining an evacuation, with occasional hæmorrhage. A month later she was in a Dublin hospital, where, she stated, a pile which appeared externally was removed. From that time she remained free from bleeding and pain for six months. Towards the end of May, 1884, she suffered from flatulence and indigestion, and the bowels, which had for a long time been costive, became more so, relief being only obtained after the use of strong purgative medicines, and then with considerable straining and pain. There was some slight discharge of bloody mucus occasionally, but not to any great

extent. A month later she became conscious of a growth in the rectum, which partly protruded when the bowels moved; lately this had increased much in size. The pain during defæcation was considerable, and was referred to a point immediately above the symphysis pubis, and she was much troubled with pruritis ani.

Upon making an examination the anus appeared normal, and the sphincter was not unduly relaxed. About an inch from the anal verge, on the anterior aspect of the rectum, two distinct and tolerably hard tumours could be felt. By passing the finger well up, the superior limits of both could easily be made out, and below them a smaller mass was to be felt. With one finger in the rectum and the other in the vagina it was easily determined that there was no abnormal adhesion between the two canals. The rest of the rectum, as far as it could be examined with the finger, appeared normal; and no enlarged glands could be felt in the hollow of the sacrum; nor was any evidence to be found of engorgement of the liver or other abdominal viscera.

I removed the growth by the usual method, Clover's crutch being employed to keep the patient in the lithotomy position. The anus was first stretched, and an incision carried from its margin back to the coccyx, dividing the posterior wall of the bowel to the extent of about 1½ inches. The angles of the incision were held asunder, and a good view obtained of the interior of the rectum and the origin of the tumours. An incision was next carried round the anterior two-thirds of the wall of the gut, about half an inch below the attachments of the growths, and well above the external sphincter. The wall of the intestine was now carefully dissected from the vagina, until it was evident that the healthy bowel could be felt between the finger and thumb above the highest limits of the disease. A curved incision was made with a scissors well free of the mass, and the whole

removed. Hæmorrhage was not as severe as might have been anticipated, only two ligatures being required. There was a little oozing from a point deep in the incision between the vagina and bowel, to which the benzoline cautery was applied, and, finally, a deep suture was passed to arrest it. No attempt was made to suture the divided portions completely. The wound was thoroughly well washed with a solution of corrosive sublimate, 1 in 2,000, and a sanitary towel wet in the same solution was applied.

The progress of the case was quite satisfactory. The temperature never reached 100°; indeed, for a few days it was subnormal, during which time she was much depressed. The bowels moved on the fourth day, and again on the eleventh; each time she had complete control of the motion, and has

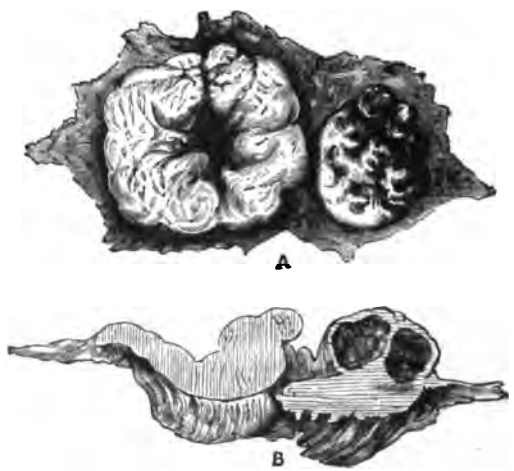

Fig. 6.—Melanotic Sarcoma of Rectum.
A, Surface view; B, section.

not since suffered from incontinence, except when she has diarrhœa. I have lately seen her (nine years after the operation): there is not the slightest evidence of recurrence; the bowels move naturally every day; and she is earning her living as a cook.

Upon examination of the structure removed it was found that a good margin of healthy tissue surrounded the disease. The piece measured about 3 inches in breadth and 2½ inches in length, and consisted of the anterior two-thirds of the rectal tube (Fig. 6). A section carried through both of the principal growths shows that the greater portion of the smaller one is of a sooty black colour, while the larger one is quite white. The third and smallest one is also melanotic. Microscopic examination, kindly made by Dr. Abraham, shows that the growth is a typical sarcoma, much pigmented. In no part of it was there to be found any evidence of proliferation of the gland tissue of the mucosa, and, as far as could be made out, the disease originated in the submucosa.

At a meeting of the Société de Chirurgie, January 28,[a] 1880, M. Nepveu delivered a lecture on the subject of rectal melanosis, and gave statistics of the cases which have previously been recorded, from which it appears that but ten instances had been noted. In only five of these was there any microscopic examination detailed, and all of these were instances of sarcoma. In two the position was immediately within the anus, once at the sigmoid flexure, and the rest were situate at the anus. In all the cases recorded the disease ran a rapidly malignant course; and in four which were submitted to operation recurrence was not long delayed.

Virchow has pointed out the remarkable fact[b] that intestinal melanosis, which is such an extremely rare disease in the human subject, is met with frequently in the horse.

Ossifying Cancer of Rectum.—As far as I am aware, the case put on record by Mr. Wagstaffe of this form of neoplasm is unique.[c] The following is a condensed summary of the case as recorded: The history pointed to disease of the

[a] Mémoires de Chirurgie (quoted by Kelsey). Paris, 1880.

[b] Pathologie des Tumeurs. Vol. ii., p. 281. Paris, 1867.

[c] Transactions of the Pathological Society of London. Vol. xx., p. 176

rectum for about twenty years, when symptoms of obstruction came on. This was followed by pelvic suppuration and death. At no time could any tumour be distinguished by examination with the finger in the rectum, nor by manipulation above the pelvis, but the history pointed distinctly to obstruction of the bowel in this region. Upon examination of the pelvic viscera, *post-mortem*, a tumour was found in the back of the rectum, of about the size of a walnut. It occupied nearly the whole calibre of the rectum, but the disease involved more or less the entire circumference of the intestine, upon a level rather above the larger mass. A small opening large enough to admit a goose-quill was found in the sigmoid flexure, about twelve inches above the cancerous growth, and communicating with a circumscribed abscess cavity within the peritoneum, and this again communicated with the rectum below the obstruction. When first laid open the surface of the cancer presented a nodulated red appearance, but the larger or posterior mass was roughened in its lower half by numerous sharp spicules of bone which projected from its surface. Section showed the growth involving the thickened muscular coat, as a hard contracting mass; and from its base firm fibrous bands ramified into the neighbouring fat, just as from the base of an ordinary scirrhous tumour. That portion which projected into the cavity of the rectum was softer, and its lower part was occupied throughout by numerous spicules of true bone. On the surface, the softer structures having sloughed away, the bony constituents were exposed. The growth did not extend to involvement of the sacrum, which was perfectly healthy, and the other bones of the pelvis were also free from disease. The other viscera were examined and found healthy. The ulceration in the sigmoid flexure appeared simple in character. The solid portion of the growth was composed of cellular and nuclear structures embedded in granular matrix. Bands and

fibres, composed almost altogether of nuclei, ramified in the growth, and could be traced as continuous with the osseous portions. It appeared that the nuclei became darker, more granular, and harder in outline as the examination was carried towards the ossified parts; the intervening matrix became more fibrous, and the processes of bone branched out into this. The bony spicules contained numerous lacunæ, whose size was about that of the ordinary nuclei of the growth. They were of various forms, generally branching, and were arranged with no regularity, but in the manner usually found in adventitious bony deposits in tumours.

Cancer of the anus is not very commonly met with; if it originates at that aperture, it is of the usual squamous type of carcinoma, and does not present any characteristics to distinguish it from the same disease in other parts of the body.

Secondary cancer of the rectum, most commonly following cancer of the uterus, does not require here any separate consideration.

SYMPTOMS OF RECTAL CANCER.

As in cancer of other parts of the body, pain is a prominent symptom at a certain period of the disease; but in the early stages it is in many instances exceedingly slight; this is so as long as the disease is confined to the interior of the rectum, and before the anus or the pelvic contents have been encroached upon. So slight is the pain, that in some instances patients consult a surgeon on account of some slight discharge from the anus or sense of uneasiness in the rectum, and an examination reveals the fact that a very extensive neoplasm is present which must have existed for months previously. I recently was consulted by a gentleman who complained of slight œdema of left arm, pain down right leg, with some loss of sensation over the area supplied by the anterior crural nerve. He never had diarrhœa, bowels moved

every day without pain, but on one or two occasions he had passed a little blood. He had a hard mass in the right iliac fossa, enlarged inguinal glands on the same side, and enlarged glands in the left axilla. He ridiculed the idea that he had anything wrong with his rectum. Nevertheless, I found upon making a digital examination that the whole pelvis was filled with a mass of rectal cancer. This freedom from pain is no doubt due, as Hilton has pointed out, to the characteristics of the upper part of the normal rectum—*i.e.*, its great distensibility and little sensibility, conditions the physiological reason of which is obvious. In the immediate neighbourhood of the anus these conditions are reversed, and, as might be expected when this region is involved in the disease, the pain experienced is extreme. It will be within the experience of most surgeons to have met with cases of malignant disease of the rectum in which for months, or even years, trivial pain alone is complained of. Sooner or later, however, pain becomes a prominent symptom, and is frequently very intense. In no locality, not even excepting the tongue, is the suffering sometimes more severe. The pain may be due to four distinct causes; and the character of the suffering in each case is quite distinct: 1. The disease may involve the anus, where, owing to the abundance of cutaneous nerves and continued motion of the part, the pain will be severe. 2. As the cancer extends beyond the limits of the intestinal tube, the nerves of the sacral plexus may be encroached upon, which may result in violent neuralgia, or in painful cramps of the muscles of the lower extremity. It is well to bear this always in mind, as not unfrequently an attack of (so-called) "sciatica" has been the first indication of a cancerous rectum. 3. Obstruction, when situated in the rectum or lower part of the sigmoid flexure, is followed by a considerable amount of pain, which is always that of a paroxysmal character, and associated with frequent efforts to

defæcate. 4. Implication of the bladder will be, of course, associated with considerable suffering, especially if the disease has progressed so as to form a fistula, and permit the flow of fæces into the bladder, or of urine into the rectum.

Bleeding is a symptom which is seldom altogether absent; and on the other hand is not often severe. It commonly follows the passage of hardened fæces, and may be taken as an indication that ulceration has commenced. A certain amount of discharge also is a common result, frequently blood-stained and abominably fœtid. At a later stage this discharge, mixed with thin fæces, comes away through the patulous anus, the relaxed sphincters having lost all power of control. The skin about the neighbourhood becomes excoriated, constituting by no means the least of the miseries to be endured by the sufferer.

Diarrhœa may alternate with constipation, or be continuously present, and is often the earliest symptom which attracts attention. Every case of diarrhœa, or so-called dysentery, which has become at all chronic, should be examined by the rectum, and in not a few the cause will be found to be a malignant growth. In some rare cases pieces of the cancerous growth may be separated and passed with the fæces, when they can be easily recognised. I have several times seen cases which had been treated for diarrhœa for considerable periods which owed their origin to this cause, and the importance of making an early examination in these cases cannot be over-estimated. Early diagnosis is of greater importance here probably than elsewhere, the great majority of cases not coming under the notice of the surgeon until the disease is so far advanced that the hope of successful operative interference is passed.

As has been before pointed out, narrowing of the intestinal tube, sufficient to retard the passage of fæces, may be due to two distinct causes in cancer: either the neoplasm may by

its exuberant growth obstruct the calibre of the bowel; or in the more chronic form, the cicatricial contraction may form a true stricture of the gut. In either case, the symptoms will be similar. Stricture of the rectum produces symptoms in some respects differing from those met with in obstruction of the intestine higher up. The continuous straining and tenesmus which is so marked in the former is absent in the latter; while vomiting of fæcal matter, which comes on tolerably soon when the small intestine is completely stenosed, may not appear for a very long time when the rectum is occluded. In some of the recorded cases complete obstruction was continuous for many weeks or even months before continuous and fæcal vomiting supervened.

Cancerous obstruction, which may have existed for some time, may eventually give way, and an exit be established for fæces through the rectum again, or by an alternative route. In the first instance, the neoplasm may slough to such an extent that the bowel will become pervious again, or, as in the case recorded by Wagstaffe, ulceration of the bowel above the obstruction may lead to perforation and the formation of stercoral abscess, which may again open into the bowel below the cancer, thus affording a new, though not very efficient, route for the fæces. In the case of the celebrated Talma, as recorded by Quain, this also appears to have been the case.

Where an opening of sufficient size forms into the vagina, the more urgent symptoms of obstruction may be relieved, but the patient is left in a truly miserable state; but where the opening takes place into the bladder, no sufficient exit for fæces will be by this means provided, and the urgency of the obstruction will continue; while at the same time the other symptoms will be much aggravated. Opening into some of the pelvic viscera by ulceration in this way may be due to breaking down of the neoplasm itself, or it may be due to the

distension and irritation of fæces above the obstruction; the ulceration then being of a simple character. This form of stercoral ulceration may take place at a long distance above the seat of obstruction, several cases being recorded where the cæcum has given way and produced a fatal peritonitis, in consequence of the dilatation due to rectal cancer. At other times nature has attempted to overcome the obstruction by the formation of an artificial anus at some part of the cutaneous surface, but such cases are of extreme rarity, and likely only to give a very inefficient relief to the obstructed gut. Dieffenbach records a case[a] in which it was necessary to evacate, by means of free incision in the buttock, an enormous quantity of fæces extravasated from a cancerous rectum; and Smith[b] gives a case in which an extravasation in this way found its way into the hip joint.

As has been elsewhere stated, the glands first affected, if the disease does not implicate the anus, will be the pelvic and lumbar systems. The former may be felt through the walls of the rectum, and the latter occasionally by deep abdominal palpation.

When secondary tumours have formed in the liver, there may be indication of its increase in size; and possibly, if the abdominal wall be thin, the surface may feel irregular and knobby.

Œdema of either leg is a symptom not uncommonly present in the later stages, and is usually of grave import as indicating an involvement of the iliac vein in the disease. In common with all forms of cancer, the peculiar cachexia soon becomes obvious, and if hæmorrhage has been at all abundant it comes on more rapidly. I think the sallow skin which is so characteristic is more marked in this form of cancer than in others. The onset of bladder implication is indicated by

[a] Quoted by Leube. Ziemssen's Cyclopædia. Vol. vii., p. 437.
[b] Surgery of the Rectum. 1872.

frequent and painful micturition; and fistula is of course soon rendered obvious after it has occurred.

In a case which I saw under the care of the late Mr. B. W. Richardson, the first symptom which aroused suspicion was turbid urine, from which a sediment settled. Upon examination by the microscope particles of striped muscular fibre and other fæcal débris were to be seen, and a digital examination demonstrated a rectal stricture high up. Leube[a] notes a case in which the secondary involvement of the ureter in rectal cancer produced a large hydronephrosis.

The duration of symptoms may, in difficult cases, materially assist the diagnosis. If there is a history of rectal trouble slowly increasing for years, it is highly probable that the disease is not malignant.

Digital Examination.—Whenever the symptoms of rectal cancer exist at all, a complete digital examination should be made. In the majority of cases, within a short distance of the anus the surgeon will feel a hard nodular and irregular surface, which may surround the entire circumference of the bowel, or be more particularly confined to one side of it. When stricture exists, the tumour frequently is felt projecting into the lumen of the bowel, and conveying to the finger a sensation almost exactly resembling that of the os uteri. Should the finger not encounter anything abnormal, the patient should be made to stand up, and the digital examination should then be repeated, the patient at the same time being told to bear down. In this way a tumour which was not within reach by the ordinary method may occasionally be explored. Should nothing still be felt, and the symptoms clearly point to rectal disease, the patient should be etherised, and a careful bi-manual examination instituted, with the patient in the lithotomy position. This method is also of

[a] Ziemssen's Cyclopædia. Vol. vii.

use in determining the height to which neoplasms, that are easily recognisable below, extend upwards. The existence of malignant disease having been determined, it is essential, with a view to treatment, to determine the following points—First, the distance to which the disease extends upwards; this may be done with the finger alone, by the bi-manual method, or by a ball-ended probang. Secondly, the movability of the rectum upon the other pelvic structures is of use in estimating whether or not the disease has spread past the limits of the intestinal tube. And, thirdly, a careful examination should be made to feel, if possible, any enlarged glands, which may sometimes be felt in the hollow of the sacrum through the rectal wall. In examining a case of this kind the greatest care should be employed, as in several recorded cases the attempt to pass a probang, or even a roughly made digital examination, has been followed by rupture into the peritonæal cavity.

In the female additional information may be gained by vaginal examination, the extent of the growth being sometimes easily determined through the recto-vaginal septum, while the fixity or freedom of the uterus is a point of great importance to make out.

Diagnosis.—There are but two conditions with which rectal cancer is likely to be confounded—viz., tumours external to the intestinal tube, and non-malignant stricture.

In the case of the former the diagnosis is easy if the disease is within reach of the finger. The fact that the mucous membrane is freely movable, and that the neoplasm is unquestionably outside the bowel, will render the matter clear. Hilton records a case[a] in which the presence of enlarged glands, which could be felt through the rectum, in a case of chronic ulceration, had given rise to the opinion that the case was one of cancer; when the ulcers healed the

[a] Lectures on Rest and Pain. P. 294. Third edition, edited by Jacobson.

swelled glands disappeared, showing that they were simply due to irritation. In the same way uterine tumours, or even the fundus of a retroflexed uterus, by pressing on the rectum and causing obstruction, have given rise to an erroneous diagnosis of rectal cancer.

To distinguish between the malignant and non-malignant strictures is a matter of greater difficulty. In this, duration of symptoms will prove of much service, the onset and progress of the non-malignant being extremely slow. The sensation conveyed to the finger will also be different. The ordinary stricture is smoother, and more regular, and there is generally an absence of the nodular and protruding masses so characteristic of cancer. Cripps has also drawn attention to the fact that in the malignant form there is usually a portion of tolerably healthy mucous membrane between the cancer and the anus, whereas in the non-malignant stricture this portion is generally more or less infiltrated.

The diagnosis between squamous epithelioma of the anus and papillomata is sufficiently easy; as in the latter the skin surrounding the tumour is not involved, the neoplasm being in some instances even pedunculated, whereas in the epithelioma there will be considerable infiltration of the true skin.

TREATMENT OF RECTAL CANCER.

The medical treatment of cancer of the rectum presents two chief points which must be borne in mind by the surgeon: first, to ensure that the bowels are kept sufficiently free to obviate the occurrence of fæcal accumulation above the disease; and, secondly, to supervise the use of morphia and other narcotics. In order to relieve pain, morphia, either hypodermically in the form of suppositories, or internally, is frequently used somewhat recklessly, with the result that there is superadded to the miseries of the rectal cancer the

mental suffering and total inability to bear physical pain of the morphia habit, so that, unless used with a very sparing hand, opium, instead of rendering the remainder of life more comfortable, adds to its suffering.

The use of bougies, or any dilating instrument, is attended with extreme danger, several cases of fatal rupture having been induced by this means.

The operative treatment of cancer of the rectum may, with advantage, be classed under two heads—the one necessarily palliative, as directed only to the relief of the prominent symptoms of intestinal obstruction and pain; the other having for its object the complete removal of the disease.

Of the former, three operations are at present practised where extirpation is inadmissible, and of these colotomy must still be ranked in the first place, although there seems to be a tendency amongst operating surgeons to make use, as far as possible, of other plans of treatment, even where the symptoms of severe obstruction are manifest. Of these procedures the most important is linear proctotomy, or external rectisection, which has, chiefly owing to the writings of Verneuil,[a] Panas,[b] and Kelsey, obtained a recognised place in surgery as a treatment for malignant stricture, and at the Copenhagen Congress[c] Verneuil speaks strongly in favour of this procedure as replacing both colotomy and excision. In many cases he considers it preferable to the former as being less dangerous, equally efficient, and more convenient; and he considers complete removal by excision impossible. Those surgeons who practise excision confine colotomy to those cases in which it is impossible to extirpate the whole mass, consequently the case in which opening of the colon is now

[a] Gaz. des Hôp. October and November, 1872. And Gaz. Hebdom. March 27, 1874.

[b] Gaz. des Hôp. December. 1872.

[c] Compte Rendu. Par C. Lange, Secrétaire Général. Tome ii., Section de Chirurgie. P. 1.

practised would be incapable, in consequence of their extension, of relief by the linear proctotomy of Verneuil. The operation, therefore, must be compared with extirpation alone, and I think that the results now gained by the latter procedure will decide most surgeons in selecting it. For the treatment of non-malignant stricture linear proctotomy is an admirable method. The suggestion of Kelsey to make two vertical incisions posteriorly, and remove the mass of neoplasm from between them, gives more room certainly, but it is open to the same criticism as the more simple operation.

The third form of palliative operation is the removal, with a scoop or the fingers, of as much as possible of the cancerous mass. Such cases are described by Allingham, Cripps, and Volkmann; and the result was a removal of the obstruction. From the recorded cases, it appears that when the mass was thoroughly broken down and removed hæmorrhage was not excessive, and sometimes even partial cicatrisation has been known to follow. Sir Joseph Lister states[a] that he has seen in the practice of Simon of Heidelberg great advantage follow the scraping of epithelioma of the rectum with the sharp spoon.

The radical cure of cancer of the rectum may be attempted by a free excision from the perinæum, or through the sacrum, and where the disease is situated high up, the operation, to which Marshall has applied the term colectomy, may be performed.

Excision of the rectum is now a thoroughly established operation, and although at first it met with a great deal of opposition in this country, it is now pretty generally adopted as the best treatment in selected cases. Originally performed by Faget in 1763, it does not appear to have attracted much attention till 1833, when Lisfranc again brought it into

[a] Lancet. May 20, 1882.

notice; but its establishment, as at present practised, is due to the German surgeons.

In order to arrive at a just conclusion as to the advantages of extirpation of the rectum, it is necessary to review the course which rectal cancer runs when not subjected to operation. It would appear, from a consideration of a large number of statistics, that the average duration of life is about two years from the appearance of the first symptoms, and during that time the condition of the patient is truly miserable. Where obstruction is present, the constant straining is a source of perpetual pain and annoyance to the patient, and even when this symptom is not present the continued mucous and bloody discharge, the extreme pain suffered when the disease encroaches on the bladder, the anus, or the nerves of the sacral plexus, combine to render this disease one of the most distressing that can possibly come under the observation of the surgeon; and it is little to be wondered at that any operation which can hold out a chance of remedying this condition should readily be grasped at by both surgeon and patient. We must, however, consider the question from more than one point of view: first, as to the immediate risk to life; second, as to the probability of complete cure, and, if so, the condition in which the patient will be left; and, lastly, supposing recurrence to take place, how long will it be delayed, and what will be the course of the secondary disease. I am convinced that a careful and unbiassed consideration of the facts bearing on these questions will serve to convince the impartial observer that they are not only sufficient to justify the operation in suitable cases, but that it is the duty of the surgeon to strongly recommend it.

Many cases have recently been recorded, more particularly by the German surgeons, showing a somewhat diminished death-rate, mainly due to improved methods of operation;

but the mortality must always remain somewhat high, as it is impossible completely to obviate stercoral fouling of the wound by any means at present at our disposal.

Let us proceed to consider these questions in detail. First, as to the immediate risks of the operation. In trying to estimate the mortality of any operation, more particularly one which has only of recent years been extensively practised (as is the case with the operation under consideration, in this country at any rate), it is manifestly useless to collect all the cases published in the journals, and from these deduce statistics, as there is a strong tendency amongst surgeons to publish isolated successful cases, while their fatalities are not so accurately recorded. Consequently, we must only place reliance upon the experience of those surgeons who give the results of the total number of operations which they have performed.

I have collected 175 cases in which, I think, we may be satisfied that the conditions necessary for faithful statistics have been carried out, so that we may take the result as fairly reliable. These give a death-rate of 16·5 per cent.; and, when we take into consideration the nature of the operation and the disease for which it is performed, we may consider this a fairly good result.

Upon looking to the cause of death in these cases, we find that in upwards of 80 per cent. periproctitis, or peritonitis, is stated to have been the chief factor in producing the mortality.

Although the full details of Listerian dressings are inapplicable to these operations, a great deal can be done in the way of antiseptic treatment to obviate the above preventable complications; and the more fully we appreciate the advantages of closing the deep parts of the wound completely by sutures, thorough drainage, frequent washings with antiseptic solutions and dusting with boracic acid, the more likely are we

to still further reduce the death-rate. Volkmann states that amongst his early cases he lost a great number from septic inflammation, but since he has adopted better methods of wound treatment his results have been very much better. He advocates continuous irrigation of the wound with an antiseptic fluid, such as solution of salicylic acid, or carbolic acid, until granulation is established. Billroth, between the years 1860 and 1876, lost 13 out of 33 cases, and all the cases died of septic periproctitis and peritonitis.[a] Cripps[b] gives twenty-three cases within his own experience, of which four died. The statistics given by Heuck[c] of the practice of Professor Czerny for a period of six years appear to be the best hitherto recorded. Of twenty-five patients operated on, only one died as a direct result of operation.

In many respects the history of rectal extirpation resembles the early history of ovariotomy; and it is highly probable that with increased care in wound treatment and operative detail the rate of mortality will be materially lessened. It is, therefore, at present premature to be guided too much by statistics.

Let us now consider what are the probabilities of complete cure; or, if recurrence takes place, how long will it be delayed? Billroth, in 1881, had only two cases in which the patients lived two years after the operation; and Allingham speaks with great caution, apparently not considering that life is even prolonged by the operation; on the other hand, Cripps found, that out of twenty-three cases, in nine the disease recurred after periods varying from four months to two years, and he was able to trace six that remained well at periods varying from two to four years. Curling[d] had

[a] Clinical Surgery. New Sydenham Society. 1881.

[b] Loc. cit. P. 397.

[c] Archiv. für klinische Chirurgie. Band XXIX. Heft 3.

[d] Diseases of Rectum. P. 164. 1876.

one case in which there was no return after six years; Velpeau records two cases which were well after ten years; and Chassaignac has had similar experience; but, probably, the best results obtained by anyone are those of Volkmann.[a] He states that three times he has had complete cures, and several cases of very late recurrence; once after six years, once after five years, and once after three. One died of carcinoma of the liver eight years after operation without local recurrence, and one case remained well eleven years after the removal of a very voluminous and high-reaching mass; in this case local recurrences in the shape of hard nodules in the cicatrix occurred twice, and were removed. In Czerny's experience, according to Heuck, nine were alive at the time of publication of the paper, and free from relapse. Of these, two had survived the operation longer than four years, one had been operated on three years and nine months before, three were well after intervals of at least two years, one at the end of twelve months, and two at the end of six months; while in fifteen cases (60 per cent.) there was a local recurrence within one year.

Dieffenbach records thirty cases in which the patients lived many years after operation, but this statement is usually looked upon with suspicion. In my own practice one patient remains perfectly well and free from return nine years after operation, while another has continued six years without recurrence.

Although the total number of cases is as yet small, and the opportunity of judging whether many of the apparent cures will be permanent is insufficient, the results hitherto recorded will compare most favourably with the records of operation for cancer in other parts of the body, notably the tongue and breast, both as regards the prolongation of life, and the possibility of complete cure.

[a] Sammlung klinischer Vorträge. May 13, 1878.

As to the condition of the patient after recovery from operation, we must remember the horrible disease for which that operation was performed, and compare the condition before and after its removal. When the sphincter has not been removed, the amount of incontinence is usually trivial, and it is only when there is diarrhœa that any trouble arises. This is generally easily met by the use of an antiseptic pad. When the entire lower end of the rectum has been removed a considerable amount of control often is maintained, but even in the worst cases of incontinence met with after ablation of the rectum the result compares favourably with the usual artificial anus following colotomy, and is vastly preferable to the state of a patient suffering from advanced rectal cancer.

A more troublesome sequela of operation than incontinence is stricture, which in many of the recorded cases appears to have given a very great deal of trouble in those cases where it has been found impossible to draw down the gut and suture it to the skin. As the extensive surface heals by granulation the orifice gradually becomes constricted, and in the hands of some of the most skilful surgeons treatment by means of tubes, incision, or even colotomy has been required. If, however, a small strip of mucous membrane can be retained down to the anus, or the mucous membrane brought down and sutured to the skin, as in the procto-plastic operation of Amussat for imperforate rectum, this trouble is not likely to arise. The freedom from incontinence which some of these patients enjoy is very remarkable. In a case of my own there is a slight prolapse of mucous membrane which occludes the anus, and prevents escape of fæces, except during defæcation. As O'Beirne pointed out long ago, the rectum in health is empty, except immediately before the act of defæcation.

Recurrence of the disease usually takes place as nodular

masses in the cicatrix; or in the deep lumbar glands, liver, or other internal organs. When occurring in the cicatrix, a secondary operation is often attended with good results. And even where not suitable for removal, these secondary growths are usually much less painful than the primary disease, owing to the destruction of the sensory nerves of the region at the time of operation. Death from internal cancer is also considerably less painful than that from unchecked cancer of the rectum.

The most complete and accurate directions as to the selection and the details of operations for excision of rectal cancer when situated low down, are those given by Volkmann.[a] He classifies the cases met with under three heads:—

1. Where there is a localised nodule of disease which can be removed by dilatation of the anus, and the wound closed by suture; this is not attended with difficulty unless situated high up. 2. Where the greater proportion of the rectal circumference, including the anus, is diseased; in this case the anus must be surrounded by an incision extending into the ischio-rectal fossa, the rectum dissected up, and amputated above the seat of disease. Volkmann, in the paper alluded to, recommends the bringing down and suturing of the divided rectal tube to the skin, drainage tubes being inserted between the stitches. 3. Where the disease is altogether above the anus, involving the entire circumference of the bowel. A deep posterior incision to the coccyx is the first essential procedure in this instance; the rectum is then incised round its circumference above the external sphincter, the bowel dissected up and amputated. This operation is open to an objection not applicable to the other two, namely, that as the blood-vessels supplying the lower portion of the rectum are of necessity divided, gangrene of this portion is

[a] Sammlung klinischer Vorträge. May 13, 1878.

apt to occur. The field of operation has recently been much extended, and cancers extending further up the bowel can now be successfully dealt with.

The following description of the *operation of perinæal excision* includes the principal points to be borne in mind. In order to prepare a patient for operation, a dose of purgative medicine should be given for a couple of nights before, and the bowel well emptied by a copious enema on the morning of the operation. The patient should be retained in the lithotomy position by means of Clover's crutch, and an incision carried deeply from the back of the anus to the coccyx. This is an exceedingly important part of the operation, as it gives full room for further manipulations; and has been called, not inaptly, by Allingham, the "key" of the operation. If the entire circumference of the bowel, including the anus, is diseased, incisions should be now carried well clear of the disease round the anus, and deeply into the ischio-rectal fossa, the attachments of the levatores ani divided, and the dissection carried upwards posteriorly and at the sides. This can be readily accomplished, but in front there is always considerable difficulty, owing to the close attachments of the rectum to the bladder and urethra in the male, and the vagina and uterus in the female. In the former the presence of a full-sized sound in the urethra will prove of much assistance, and in the latter the occasional introduction of the finger into the vagina will serve a like purpose. For dissecting the intestine free, a pair of blunt-pointed scissors will be found the most convenient instrument; and assistance may be gained by the use of a blunt hook, using it in the same way that a strabismus hook is used to hook up the ocular muscles in an enucleation of the eyeball. If the disease has not implicated the anus, or if a vertical strip of mucous membrane be unaffected, the preceding operation should be so far modified as to leave as

much normal tissue as possible, care being always taken that at least one quarter of an inch of healthy tissues surrounds the disease upon all sides. The dissection having been carried up to healthy tissue above the disease, the rectum is to be amputated. For fear of hæmorrhage *this* has frequently been done with the écraseur, the Paquelin cautery, or even the ligature; but as the part is so well under control bleeding need not be feared, and the section can be made much more cleanly with a pair of curved scissors. A number of catch forceps should be at hand to secure vessels as they are divided, but there is not likely to be any free bleeding until the last section is made, and *then* the arteries can be picked up, and tied generally without difficulty. An important question now to decide is whether any attempt should be made to bring down the gut and suture it to the skin wound. Cripps strongly advocates leaving the wound to granulate without the application of any sutures, his objection to the stitches being that they cut out before union takes place, and that while in place they produce little pouches outside the gut in which fluids will collect, and become septic; while leaving the wound entirely open, with the patient in the recumbent position, ensures absolutely free drainage. Other operators give similar advice; while Volkmann and Czerny recommend stitching, so as to diminish wound surface as much as possible, and by joining mucous membrane to skin to obviate the tendency to stricture. It appears to me that a great deal depends upon the way the sutures are put in. If they are simply put through the skin, and then through the gut, they will, when closed, make a cavity outside the rectum; but if they are passed deeply through the surrounding pelvic structures as well, these cavities cannot be formed, and as the strain will be then divided over a larger surface, the tension will be taken off the gut so much that they will be much more likely

to hold (Fig. 7). If two such sutures are passed on each side they will bring the gut well down if it has not been divided very high up, and a number of superficial sutures should then be put in to complete the adjustment of the skin and mucous membrane. I consider the deep closing of

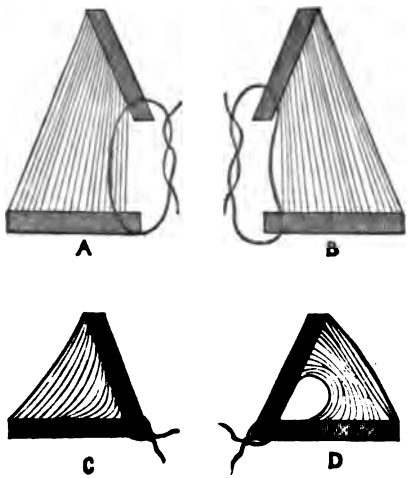

Fig. 7.—Diagram showing the method of passing Sutures.
A, Suture passed deeply; C, the same suture closed; B, suture passed through bowel and skin only; D, the same suture closed.

the wound a most important element in the operative detail. After the operation an attempt may be made to keep back the fæces by plugging the gut with iodoform gauze or other similar antiseptic material, a catheter passed through the plug being left in the bowel to permit of the escape of flatus. If the gut will tolerate this plug, and it can be left *in situ* for a week or ten days, it will prove of enormous advantage, by permitting a complete adhesion of the gut to the perinæal wound to take place. The diet for the first fortnight after the operation should be carefully regulated, so as to leave as little solid residue as possible.

Complications of the Operation.—Wound of the peritoneum is of frequent occurrence, and careful anatomical measure-

ments have been made to determine the distance of the peritonæal pouch from the anus, so as to define the limits within which the rectum can with safety be removed. Such measurements are, however, comparatively useless. In the first place the measurements must vary with the different positions of the anus, and the amount of fluid in the bladder; and the relation of the serous covering to the bowel in *health* is no criterion whatever as to its state when the rectum is diseased, as the constant straining, if there is obstruction, and the dragging due to contraction of the cancer, will materially alter the normal relations. The only important anatomical point to remember in this connection is the fact that, in the female, the peritonæal pouch descends about an inch farther than it does in the male. Allingham states[a] that he has met with peritoneum within two inches of the anus in a female, and removed five inches of gut in a man without ever having seen it. In order to render wound of the peritoneum less likely to take place, I have tried fully distending the bladder before operation, which I find has a much greater effect in lifting the peritoneum away from the bowel than the converse proceeding of distending the rectum has of clearing it away from the suprapubic region for lithotomy. This is manifestly of greater use in the male than in the female, and the distended bladder is more easily recognised and protected during operation thanh te empty one. Wound of the peritoneum does not, however, appear to be such a serious complication as some surgeons have thought. According to Heuck[b] this accident occurred in eleven of Czerny's cases; in six of these the wound was sutured, while in the remainder the rent was left open, care being taken to join accurately the margin of the divided bowel to the skin, thus preventing extravasation. As Cripps,

[a] Loc. cit. P. 281.

[b] Loc. cit.

however, has pointed out, direct involvement of the peritoneum in the cancerous growth is a very serious complication, as it indicates such an implication of the lymph paths that recurrence of the disease cannot long be delayed.

Implication of the other pelvic structures is a very serious complication, and, when extensive, must be held to contra-indicate operation. A slight involvment of the recto-vaginal septum, however, can easily be dealt with, the vaginal opening being either closed at the time of operation, or by a subsequent plastic procedure. Where, however, the bladder, prostate gland, and urethra are much involved, the prospect of useful interference is small indeed; although a case is recorded by Nussbaum in which a man was reported well three years after the removal of rectum, prostate, and neck of bladder;[a] but such extensive operations have not since been frequently imitated.

Amongst the modifications of excision, the combination of colotomy with it is one of the most important. In a paper read at the Société de Médecine of Lyons, in May, 1884,[b] M. Maurice Pollosson advocates the combination of laparo-colotomy with extirpation of rectal cancer. He selects the left iliac region as the site for the operation, because there more readily than in the lumbar region can he close up the lower segment of the bowel, which closure he regards as a point of essential importance in the operation. This he does by invaginating some millimetres of the lower free end after dividing the bowel clean across, and closing up the opening completely by means of five or six catgut sutures, which thus bring into close apposition the serous surfaces. The artificial anus is completed by suturing the upper extremity of the bowel carefully into the wound. After the patient has recovered from this operation he proposes to extirpate

[a] Bayr., ärtz. Intelligenzblatt. November, 1868. Quoted by Van Buren.

[b] St. Louis Courier of Medicine. July, 1884.

the cancerous mass, which, by virtue of the preliminary operation, is practically removed from its relations as a part of the digestive tract, and converted into a pelvic tumour. Operating under the conditions so brought about, it is possible to apply the principles of antiseptic surgery much more thoroughly and efficiently than in the conditions existing without such a preliminary operation. In most cases he believes that it would be advisable to allow the patient to recover from the effects of the first operation before performing the second; though in certain cases he thinks that circumstances might be such as to make it better to go on and extirpate the cancerous mass at once after establishing the artificial anus.

Mr. James E. Adams has recommended[a] the performance of lumbar colotomy as a preliminary measure in all but the very slightest cases, and as soon as the patient had recovered from this to excise the rectal cancer from the perinæum. The advantages of diverting the fæces from the wound during healing, and from the recurrent growth, should it take place, are sufficient in his opinion to quite justify the additional operation. In a case in which he performed the double operation, and in which the patient was under observation for two years subsequently, he states that the advantages were very obvious. Although a recurrence took place six months afterwards, the patient was quite unaware of its existence. The annoyance was so trivial, he contends, that by adopting the course indicated, any patient might pass through all the phases of this horrible and fatal malady with scarcely any pain at all.

I should not be disposed to adopt either of the above modifications except under very special circumstances, as the advantages of retaining the fæcal outlet in the perinæum are very great.

[a] British Medical Journal. Aug. 15, 1884.

The Removal of Cancers situated high up.—There is a class of cases which, as Volkmann has well described, are too high for removal from the perinæum, and too low for removal by laparotomy. Dr. P. Kraske, of Freiburg,[a] communicated to the German Surgical Congress a method which he had worked out on the cadaver. According to him access to the upper part of the rectum is made far easier by splitting the soft parts in the middle line from the second sacral vertebra to the anus, dividing the muscular attachments to the sacrum as far as the edge of the bone on the left side; excising the coccyx, and then dividing from the sacrum the attachments of the two sacro-sciatic ligaments, and drawing away the left edge of the wound. Still further access to the upper portion of the rectum is gained by chiselling away a bit of the lower left side of the sacrum. If the bone be divided in a line beginning on the left edge at the level of the third posterior sacral foramen, and running in a curve concave to the left through the lower border of the third posterior sacral foramen, and through the fourth to the left lower corner of the sacrum, the more important parts, especially nerves, are not injured; and the sacral canal is not opened. The upper portions of the rectum thus become so accessible that the rectum can be brought into full view and amputated without difficulty up to where it passes into the sigmoid flexure. Further, this procedure admits resection of the upper rectum with preservation of its lower end. Kraske tried this method on the dead body in a case of high rectal cancer; and then twice on the living subject. Once in a debilitated woman, aged forty-seven years, the cancer commenced a short distance above the anus, while its upper end could not be felt. The rectum was amputated (with avoidance of the sphincter) where it was wholly surrounded by peritoneum. The patient made a good recovery. His

[a] Annals of Surgery. Vol. ii., p. 415. 1885.

second case was in a man, aged thirty-seven years; the lower extremity of the disease could just be reached with the finger. A portion of the lower bowel was spared, though divided posteriorly. The gut was pulled down, and the anterior two-thirds united by suture. The lower (posteriorly open) portion was closed later by a plastic operation.

Kraske's paper has opened up a field of operation in cases which before were considered quite inoperable, and his method has now been frequently adopted, and modified in several important details, particularly by the German surgeons. The method adopted by Bardenheuer (Volkmann klin. Vorträge, 296) appears at once the simplest and most satisfactory. An incision is carried from the back of the anus to the middle of the sacrum, the muscles divided from the sacrum, and the sacro-sciatic ligaments cut through; the sacrum is now cut through transversely at the level of the 3rd sacral foramen, and the posterior surface of the rectum cleared in the superior pelvi-rectal space (above the levatores ani, with their fascial coverings). As the whole hand can now be introduced into the pelvis, the bowel can be explored up to the sigmoid flexure if necessary. If the disease is situated entirely above the attachment of the levatores ani, the resection of the diseased bowel with circular suture of the intestine is indicated, or, where the anus is involved, this portion can be extirpated and the upper lumen of the bowel brought down and sutured to the most convenient portion of the incision.

I have adopted the trans-sacral extirpation of rectal cancer in three cases, in all of which a successful result was obtained. Of one of these (No. 10 in Table) I will give the details, as it may be taken as a typical case of the operation for high situated cancer:—

A woman, aged thirty, had suffered from symptoms of rectal cancer for eight months, with gradually increasing obstruction,

which at the time of her admission to hospital had almost become complete. Digital examination revealed a ragged, ulcerated surface entirely surrounding the rectum, commencing immediately above the anus and extending higher than the finger could reach. The tumour was freely movable in the pelvis, and its upper limits were made out by bimanual examination. An incision was made from the back of the anus to the middle of the sacrum, and the muscles and ligaments divided from the bone. The sacrum was now divided through the 4th bone, an American pruning shears being used for this purpose, which did the work much more rapidly than a saw, and without the crushing of an ordinary bone forceps. The piece of bone was removed and the rectum cleared with fingers and scissors. This portion of the operation is much more easily done from above than from below the levator ani muscle. As the anus was involved it was surrounded by an eliptical incision, and the entire rectum dissected free. In doing this the peritoneum was opened anteriorly. The rectum was divided close to its junction with the sigmoid flexure, about one inch above the highest limit of disease. As the strain would have been too great to bring down the gut to the normal position of the anus, it was brought out at the upper angle of the wound, where it was secured without undue tension in the position formerly occupied by the base of the sacrum and upper bone of coccyx. The peritonæal wound was adjusted by fine catgut suture, and the entire perinæal wound, including the former position of the anus, was carefully closed by a series of deep sutures passing under the bottom of the wound, and a few superficial stitches where required to adjust the skin accurately. Primary union ensued through the entire wound without a single drop of suppuration. The patient suffers little inconvenience from her sacral anus, as she has a very considerable power of continence. The tumour removed is illustrated (Fig. 3). It proved to be a colloid carcinoma.

Subjoined is a table of cases of excision of cancer from my own practice. The cases subjected to excision constitute only a small proportion of the entire number of cases of cancer of the rectum coming under notice. The vast majority, when presenting themselves, having such extensive pelvic adhesion that they were deemed inoperable, except where obstruction was marked when colotomy was undertaken.

Cases of Resection of Rectum for Malignant Disease.

Name	Date	Sex	Age	Hospital	Private	Method	Pathology	Result	Observations
1. B. M'L.	Nov. 1st, 1884	F.	60	H.	—	Post linear incision	Melanotic sarcoma	R.	Perfectly well, and able to earn living as a cook 8 years afterwards
2. Dr. N.	Oct. 5, 1886	M.	65	—	P.	do.	Cylinder-celled epithelioma	R.	Perfectly free from recurrence 6 years after operation
3. W. F.	Nov. 21, 1887	M.	62	H.	—	do.	do.	D.	Septic peritonitis
4. M. D.	July 16, 1889	F.	48	H.	—	do.	do.	R.	Vaginal septum implicated and removed; recurred in suture points 6 months subsequently
5. Mrs. M'K.	Oct. 18, 1889	F.	70	—	P.	do.	do.	R.	Died suddenly a year subsequently; no evidence of recurrence
6. Mrs. F.	Jan. 5, 1890	F.	60	—	P.	do.	do.	D.	Died of shock same day
7. Miss H.	Feb. 22, 1890	F.	45	—	P.	do.	do.	D.	Septic peritonitis
8. Mr. A.	Feb. 18, 1891	M.	55	—	P.	Transverse division of sacrum	do.	R.	Recurred as abdominal carcinoma a year subsequently
9. O. R.	March 19, 1892	M.	70	H.	—	do.	do.	R.	——
10. B. C.	Feb. 2, 1893	F.	26	H.	—	do.	Colloid cancer	R.	Continence good
11. Mr. A.	May 15, 1893	M.	60	—	P.	Perinæal incision	do.	R.	Occurred in cicatrix of fistula operation

COLOTOMY.

The history of this operation is in many respects one of interest. Although it is upwards of a century and a half since it was first proposed, it is only within the last thirty years that it has been practised upon at all a large scale, as a means of obviating death in one of its most painful forms, viz.—by intestinal obstruction; and its present position as a recognised operation is mainly due to the efforts of English surgeons, notably Curling, Bryant, and Allingham. Apparently the first suggestion of the operation was made by Littré in the year 1710, but it does not appear that he performed colotomy; and it was not till sixty years afterwards that the operation was actually performed on the living subject by Pillore, of Rouen, who opened the cæcum in the right inguinal region. The dread of wounding the peritoneum, which, with our ancestors, was so great, suggested to Callisen the possibility of opening the descending colon, where it was uncovered by peritoneum in the left loin; but failing in this intention on the dead body, he does not seem to have attempted it on the living. In 1797 Fine, of Geneva, opened the transverse colon by an incision in the umbilical region. Subsequently Amussat published six cases, in which he was able to open the colon without wounding the peritoneum, five of these cases terminating successfully; and since then the operation of lumbar colotomy has borne the name of this distinguished surgeon, and is universally recognised as "Amussat's operation."

As the object of this procedure is to provide an alternative outlet for the intestinal contents, through which more or less incontinence of fæces is a necessary result, it follows that the condition of the patient afterwards is by no means pleasant to himself or those about him: it is, therefore, only to be undertaken in cases in which the indication is very

clear, and after the patient has been fully told of the inevitable result of the operation. In the case of imperforate infants, where perinæal incision has failed, it is the duty of the surgeon to lay the case fully before the parents, telling them that life may be possibly saved by means of colotomy, whereas without it death is certain. The onus of deciding for or against colotomy should be thrown on the parents in cases of imperforate rectum; but where the patient is an adult, suffering from obstruction, he alone must decide. In the latter case the pain and distress is usually so extreme that the sufferers generally gladly accept the conditions, and when the case is successful in relieving urgent symptoms, are loud in their thanks for the relief obtained. The surgeon has no right in these cases of his own motion to act as the arbiter between life and death; and, if he fail to recommend colotomy in urgent cases, is, in my mind, as guilty of dereliction of duty as if he refused to sanction tracheotomy for the relief of a patient suffering from obstructed glottis.

It is necessary to clearly indicate the conditions calling for this operation, and they may be conveniently grouped under the following heads:—1. Congenital malformations which cannot be relieved by perinæal incision. 2. For the relief of distress attending recto-vesical fistula. 3. For obstruction, the result of (*a*) pressure of tumours; (*b*) cancer of the bowels; (*c*) non-malignant strictures, which are of such an extent as to preclude perinæal operation. 4. As a means of treating extensive ulceration, by providing physiological rest to the part.

Operation of Lumbar Colotomy, Amussat's Operation.—This operation, which used to be the one most frequently recommended, and has until recently been generally adopted in all cases of obstructive disease of the rectum in the adult, is one of some little difficulty to the inexperienced operator; and it is therefore essential to bear in mind the anatomical land-

marks which indicate the position of the descending colon, in order to avoid the accidents which have not unfrequently happened during its performance. Allingham has directed special attention to this subject.[a] He says: "The anatomical guide to the position of the ascending or descending colon is the free edge of the quadratus lumborum muscle, but this is by no means always easily found, and consequently it is better to substitute a more certain and unmistakable guide; and this may be obtained by marking a spot on the crest of the ileum fully half an inch posterior to a point midway between the two superior spinous processes. From more than fifty dissections and the experience of over eighty operations of my own and others, I can confidently assert that the colon is always normally situated opposite this point. Before operating I mark this spot with ink or iodine paint, and I have always found it, when the superficial structures are divided, a most useful landmark and guide to the exact position of the intestine."

The vertical incision of Callisen, and the transverse incision of Amussat, gave place to the oblique incision as recommended by Bryant, and for it the following advantages are claimed: More room is afforded for manipulation; the incision taking the course of the vessels and nerves lessens the liability to their injury; that, following the ordinary integumentary fold when the patient is recumbent, it facilitates repair and tends to prevent prolapse of the bowel.

Before operating the bowel should be as completely emptied as possible by means of laxatives, and an enema, if the obstruction is not complete. The patient should lie in the semiprone position, with a small, hard pillow under the opposite loin. An incision should now be made parallel to the last rib on the left side, midway between this bone and the crest of the ileum; the centre of this incision, which

[a] Diseases of the Rectum. P. 302. Fourth edition.

should be about four inches in length, should correspond with Allingham's point. The incisions are now carried deeply, some fibres of the latissimus dorsi and posterior edge of external oblique muscles being divided; and the edge of the quadratus lumborum muscle and lumbar fascia next looked for. The fascia when found should be freely divided, and probably also a little of the outer edge of the quadratus lumborum. The fascia transversalis is now met with and divided, and the subperitonæal fat exposed. If the gut does not now present in the incision, two pairs of dissecting forceps should be taken, and with them the little masses of fat pulled asunder, and the search prosecuted, the most usual mistake being that of looking for the bowel too far forward. If any difficulty still be experienced, the body should be rolled a little forward; and at the same time air may be injected into the rectum by means of Lund's insufflator. This will usually have the effect of rolling the bowel into the wound. The colon thus reached and having been identified, deep sutures may now be passed through the entire thickness of the abdominal wall, and through the posterior wall of the colon. A longitudinal incision is now made in the gut, the loops of the sutures hooked out, cut, and tied, and as many more sutures as may be necessary to completely adjust the skin and mucous membrane put in. Immediately after opening there is often a free discharge of fæces; while at other times, especially if the bowel has been first well cleared, no fæces may pass for several days. In one of my cases nothing passed till the sixth day; and my friend, Mr. Thomson, tells me that in a case upon which he operated nothing passed for seventeen days. It is a considerable advantage when this is the case, as it permits of healing of the wound to take place quietly without disturbance. A pad of tenax, or other absorbent antiseptic material, should be kept applied, and changed whenever the bowels move; and it will much con-

duce to the comfort of the patient and those around him if large doses of charcoal are administered internally, which, in addition to making the motion harder, tend to remove the odour. I have recently tried for this latter purpose naphthaline in two grain doses, given wrapped up in wafer paper, and found it answer admirably as a deodoriser.

At first there is no control whatever over the motions, and the patient is very miserable if there is any tendency to diarrhœa; but, later on, if the bowels are kept moderately costive, there is usually but one motion in the twenty-four hours, and, although the patient has no power to restrain it, he knows when it is coming sufficiently long beforehand to make the necessary preparation, and with an absorbent pad comfortably adjusted he is then tolerably comfortable. At any rate, the freedom from pain, and frequent straining, contrast now most favourably with the antecedent miseries of rectal obstruction.

Accidents during and consequent on Operation.—Wound of the peritoneum is of frequent occurrence; and when there is a meso-colon present, its injury is inevitable. If the opening is at all free, prolapse of small intestine is likely to take place, and considerably complicate the operation. In such a case the proper course would be, having reduced the prolapse, an aseptic sponge should be plugged into the wound, and the search for the colon prosecuted, and as soon as it is found the peritonæal wound must be carefully closed before attempting to open the bowel.

In some cases the operator has failed entirely in finding the colon, some portion of the small intestine being opened in its place. It is hard to imagine how this accident has occurred on the left side, because the small intestine could only be reached after the peritoneum has been opened, and under these circumstances the appearance of the longitudinal bands and appendices epiploicæ are so characteristic of the

large intestine that with ordinary caution the distinction should easily be made. On the right side the mistake of opening the duodenum instead of the colon appears to me to be a much more real danger. One of the most experienced colotomists at present living has candidly admitted that this accident has occurred in his practice.

During the after treatment one of the greatest dangers is the occurrence of diffuse inflammation and suppuration along the areolar spaces of the abdominal wall. I have seen very extensive sloughing of the skin of the loin follow an operation of this kind.

Although it is impossible, from the nature of the wound, to follow strictly the rules of antiseptic surgery, much may be done in this direction with corrosive sublimate solution and iodoform; but the most important of all measures, I believe, is the accurate suturing of the mucous membrane to the skin, and thus preventing extravasation of fæces.

During the after treatment also, a collection of fæces in the lower segment of the gut is a troublesome complication. When occurring to any extent it may produce, as Bryant has pointed out, symptoms of intestinal obstruction, notwithstanding the fact that an outlet for fæces exists higher up; and even where this is not the case the irritation in cases of malignant ulceration defeats to a great extent the object of the operation, while in cases of vesico-intestinal fistula the trouble is even more exaggerated. In order to remedy this, several suggestions have been made:—(1) to pass the sutures deeply, so as to include the entire thickness of the bowel instead of its posterior aspect only. As this, however, necessitates the passage of the sutures across the peritonæal cavity it does away with the sole advantage claimed for lumbar colotomy. (2) It has also been attempted to bring out a knuckle of intestine at a very acute angle, in the hope that in this way a spur might be formed similar to that

which is found in artificial anus following hernia. (3) The only proceeding, however, by which the advantages of lumbar colotomy can be combined with absolute closure of the lower segment is by means of the operation recommended by Mr. Thomas Jones.[a] He detached the mucous membrane from a prolapsed portion of gut, and from the lower margin of the colotomy opening, turning it on itself, and attaching the raw surfaces by means of catgut, and afterwards brought together the surfaces denuded of mucous membrane. No fæcal matter passed beyond the opening after this procedure had been carried out. Of course it is obvious that no attempt to close the lower opening should be contemplated when there is a possibility of establishing at some future date the normal exit for fæces.

Another troublesome after complication is prolapse of the bowel through the artificial anus. This is frequently due to the continued expulsive effort trying to get rid of the accumulation of fæces in the lower portion of the bowel. It is to be treated by the adjustment of a well-fitting pad, and, if possible, by the closure of the lower orifice. In a case of recto-vesical fistula, in which lumbar colotomy had been performed, I found this method answer admirably.

In common with all other extensive wounds of the abdominal parietes, hernia may occasionally occur. Of this accident Mr. Simpson records an instructive example.[b] Upwards of four years after the operation of colotomy, the patient felt something suddenly give way while coughing, and a tumour appeared immediately below the artificial anus, and he died in two days. At the *post-mortem* the tumour was found to contain a large loop of ileum in part gangrenous.

Operation of Inguinal Colotomy (*Littré's Operation*).—Under

[a] British Medical Journal. April 24, 1886. P. 782.

[b] British Medical Journal. May 23, 1885. P. 1039.

this head is usually described the operation of opening the cæcum, or sigmoid flexure, by an incision in the right or left groin. It is with the latter alone that we are at present concerned in considering the treatment of rectal disease. It is, of course, obvious that in this procedure the peritoneum is necessarily injured. It is performed by making an incision through the muscular coats of the abdomen parallel to Poupart's ligament, and then drawing forward a loop of large intestine, securing it to the wound, and opening the bowel between the points of suture; the subsequent treatment being similar to that of lumbar colotomy. The operation has been pretty generally selected in preference to the retro-peritonæal procedure in cases of imperforate rectum, because in these cases the colon is very hard to find from behind, and is frequently attached by a meso-colon, which would necessitate a peritonæal wound.

Statistics of the Older Methods of Colotomy.—The most comprehensive record of cases of colotomy hitherto published is that by Dr. W. R. Batt;[a] and the following is his analysis of cases, slightly condensed: Of a total of 351 operations, 154 were performed for malignant disease, 20 for fistula, 52 for imperforate anus, 40 for obstruction, 72 for stricture, 4 for ulceration, and 9 for miscellaneous causes. The recoveries were 215, deaths 132, equal to a mortality of 38 per cent., the result of 4 cases being unrecorded. Of these, the number of operations performed by Amussat's method was 244: 165, or 68·2 per cent., recovered; 31·8 per cent. were fatal; and the result in 2 cases is unrecorded. After Littré's method 82 operations were performed: of these, 38, or 46·9 per cent., recovered, and 43, or 53·1, proved fatal, the result in 1 case being unrecorded. After Callisen's method 10 were operated upon, 2 of which recovered, 7 were fatal, and in 1 the result is not stated. Four cases were performed by Fine's method,

[a] American Journal of Medical Sciences. Oct., 1884. P. 423.

all of which are recorded as having been successful. In one fatal case a T-shaped incision was adopted, while in 10 the method of operating was not stated. Of these, 6 recovered and 4 proved fatal. Of the total number, 160 were males, 147 females, and in 44 the sex was not given. Of the 154 cases operated on for malignant disease, 105, or 68·4 per cent., recovered; 48, or 31·6 per cent., were fatal; and in one case the result is not stated. The patients in 72 instances were males, in 74 females, and in 8 the sex was not mentioned. Following Amussat's method were 124 cases, of which 91, or 73·5 per cent., recovered, and 33, or 26·5 per cent., were fatal. According to Littré's method there were 23 cases, with 12, or 52·2 per cent., recovering, and 11, or 47·8 per cent., proving fatal; of the 4 cases following Callisen's method all proved fatal, and Fine's case recovered. Of the 2 in which the method was not stated, 1 recovered and 1 died. The ages of the patients were as follows: 20 to 30 years, 22; 30 to 40 years, 22; 40 to 50 years, 30; 50 to 60 years, 29; 60 to 70 years, 18; over 70 years, 2; while in 31 cases the age was not given. With regard to the duration of life after operation in malignant cases, Dr. Batt has published the following details of cases in which the patients recovered from the immediate effects of operation: 13 died within six months, 15 between six months and one year, 10 died between one and two years, 8 died between two and three years, and one died four and a half years after operation. Of 20 cases operated on for fistula, 18, or 90 per cent., recovered, 2 alone proving fatal. Following Amussat's method were 17 cases, with 15 recoveries, and 2 deaths; and by Littré's method one case, which terminated favourably. The method of operating is not mentioned in two cases which recovered. Of the 52 cases operated on for imperforate anus, 24, or 47·1 per cent., recovered; and 27, or 52·9 per

cent., were fatal; and the result in 1 case is not stated. Following Amussat's method were 12 cases, 6 recovering and 6 ending fatally; and following Littré's method were 34 cases, 17, or 51·5 per cent., of which recovered; 16, or 48·5 per cent., ended fatally; and there is one case in which the result was not given. Five cases were operated on after Callisen's method, 1 of which recovered and 4 died. In 1 fatal case the method is not mentioned. Of 40 operations for obstruction, 19, or 50 per cent., recovered; 19 died; and in 2 the result was not mentioned; 24 were performed by Amussat's method, of which 13, or 59 per cent., recovered, 9 terminated fatally, and in two the result is not mentioned. Eleven cases were performed after Littré's method, of which 3 recovered and 8 proved fatal; and 3 are recorded by Fine's method, all of which recovered; in one case in which the method is not stated, and in one case in which a T-shaped incision was made, a fatal result followed. Of the 72 cases operated on for stricture, 41, or 57 per cent., recovered, and 31, or 43 per cent., ended fatally. Following Amussat's method were 59 operations with 35 recoveries, 59 per cent., and 24 deaths. After Littré's method were 10 cases, with 4 recoveries and 6 deaths. Callisen's method was performed in one case which recovered, and two cases are given in which the method is not mentioned, one terminating in recovery, the other fatally. Of the 4 operations performed for ulceration, 3 terminated in recovery and 1 in death. All were performed after Amussat's method. And of 9 patients operated on for miscellaneous causes, 5 recovered and 4 died. Amussat's operation was performed in 4 cases, Littré's in 2, and in 2 the method is not mentioned.

Arranged in a tabular form showing the various forms of operating, we find the following convenient summary condensed from Batt:—

Form of operation	Cases	Result not ascertained	Recovered	Died	Mortality per cent of terminated cases
Amussat .	244	2	165	77	31·8
Littré .	82	1	38	43	53·1
Callisen .	10	1	2	7	77·7
Fine . .	4	—	4	—	0·0
Not stated .	11	—	6	5	45·4
Total . .	351	4	215	132	38·0

According to these statistics, the mortality of inguinal colotomy is 20 per cent. greater than that of the retro-peritonæal operation. According to Erckelen's statistics,[a] the mortality shows a difference of 10 per cent. in favour of Amussat's operation. I think, however, that it will be admitted that statistics of this kind, which are collected from published cases, are at all times misleading; but especially is this the case in the instance at present under consideration, for in the first place the inguinal operation has been selected in a large proportion of the total number as a treatment for imperforate rectum, and frequently not adopted until after an extensive exploration from the perinæum, when the patient was nearly exhausted. And, again, as these statistics contain the records for many years back, they embrace a period when peritonæal surgery of all kinds was in a very different condition from that in which it is at the present day, so that I think the time has come when the relative merits of both operations may be fully discussed without our being too much influenced by the results obtained under the older methods of wound-treatment, and at the present day the verdict in favour of anterior colotomy is, amongst modern surgeons, almost universal. The unquestionable advantages of laparo-colotomy are these: 1. It permits a thorough exploration of the abdominal cavity, which may

[a] Archiv. f. klin. Chir. Langenbeck. P. 41. 1879.

enable the surgeon in some instances to perform a more radical operation for the complete removal of the disease, and if removal is impracticable it ensures that the opening is made above the seat of obstruction instead of below, as has happened with the lumbar operation. 2. The large intestine is found with ease and certainty. 3. A complete operation for closure of the lower lumen when considered necessary can be much more readily and completely carried out, thus making the artificial anus a *terminus*, and not a lateral outlet to the intestine. 4. A shorter distance of intestine intervenes between the opening and seat of disease. 5. The abdominal wall being thinner in front, the extent of wound surface is less, and the finer skin in the front abdominal wall permits a much more accurate coaptation of skin and mucous membrane. 6. The position of the wound is much more convenient for the patient, and it is interfered with less by the clothing. 7. A largely decreased death rate. So then the sole disadvantage of laparo-colotomy is that now exploded surgical bugbear, wounding of the peritoneum; and it must be remembered that even in the hands of skilled colotomists wound of the peritoneum in the lumbar operation has not unfrequently taken place. It is manifestly easier to deal with a peritonæal wound, advisedly and carefully made, than with an accidental opening at the bottom of a rather deep incision.

Delayed opening of the Intestine. "Operation à deux temps."—The unequivocal advantage which has been found to follow the division of the operation of gastrostomy into two stages has naturally suggested a similar manner of proceeding in colotomy; and cases have recently appeared in which both laparo-colotomy and lumbar colotomy have thus been performed. In a communication made to the Clinical Society of London by Mr. Davies Colley,[a] three cases are recorded in which the lumbar operation was performed in two

[a] Lancet. March 21, 1885.

stages, the intervals being one, four, and six days respectively. It would appear from these cases that the procedure necessary to retain the loop of bowel in the wound was attended more or less with symptoms of intestinal strangulation, and in order to minimise this result as much as possible, Mr. Davies Colley has devised a form of clamp, in which two pairs of ivory studs placed on steel bars are made to grasp the bowel at two places, and by this means the loop of intestine is held without being strangulated, until sufficient healing of the wound has taken place to obviate any risk of extravasation. In two out of the three cases this instrument was used, and the resulting constitutional symptoms are described as being trivial.

The analogy between gastrostomy and colotomy, however, scarcely holds, because the mere fact of retaining a small portion of the stomach wall in the abdominal wound can have no direct influence one way or the other on the œsophageal disease for which the operation has been undertaken; while in the case of the colotomy a certain amount of obstruction will probably have existed before the operation, which will be increased by the drawing out the loop of intestine.

I operated on a case of rectal cancer in November, 1884, by laparo-colotomy, having chosen this operation deliberately, as, in view of modern surgery preferable to lumbar colotomy. A loop of the sigmoid flexure was drawn out, emptied by pressure upwards from the seat of obstruction, and caught between two clamps; it was now divided between the clamps; the wall of the lower segment was inverted so as to bring the peritonæal surfaces into apposition, and carefully sutured up, and the upper orifice was stitched to the wound. This patient lived for two years and a fortnight after the operation. Until a short time before her death she was able to go about and attend to the artificial anus without help; the bowels moved but once a day, and she was conscious that the

motion was coming sufficiently long beforehand to make all the necessary preparations.

I have now performed laparo-colotomy thirteen times altogether, and all of them recovered completely from the operation. I might have increased this number considerably had I advised the operation as a routine practice in cases of rectal cancer too advanced for excision. I have only recommended colotomy in cases where obstruction was a prominent symptom, or where some complication, as vesical fistula or extreme pain from involvement of anus, was present. I am satisfied that the majority of cancer cases which have passed the period for useful excision, will go on to their fatal termination quite as easily and slowly without colotomy. If, however, obstruction or other complication arises it is the surgeon's duty to recommend the operation.

The writings of Mr. Cripps and Mr. H. Allingham have done much to popularise this operation, and I cannot conceive anyone who has had experience of anterior colotomy again resorting to lumbar colotomy, except, possibly in cases of extreme meteorism, and even under these circumstances, if the incision is kept small, and a sponge at once introduced into the peritoneum prolapse of small intestine can be readily controlled.

Much has been done to simplify this operation. It can now be done with the greatest ease and rapidity, while the mortality inherent to the operation has been reduced to the most insignificant proportions. Instead of making the inguinal incision, recommended by most authors, I am convinced that the left linea semilunaris is the best position. It is the thinnest portion of the abdominal wall, and as frozen anatomical sections show, the sigmoid flexure usually lies against this line, and presents in the wound the moment the peritoneum is opened. No muscle is wounded, so that the wound can be brought accurately together, lessening the risks of abdominal hernia and extensive prolapse subsequently. If the incision

does not extend lower than a line joining the umbilicus with the middle of Poupart's ligament, the deep epigastric artery will not be injured.

Method of performing Laparo-Colotomy.—I have now quite discarded the use of any clamp, and conduct the operation as follows:—Make a short incision (1½ to 2 inches) along the outer border of the left rectus abdominis muscle, so that the lower termination is above a line joining the middle of Poupart's ligament with the umbilicus; divide the tendinous structures of the linea semilunaris and peritoneum the entire length of this wound; introduce a small aseptic sponge into the peritonæal cavity, and stitch with fine catgut the peritoneum to the skin by continuous suture all round the wound. If the colon does not directly appear in the incision, introduce a finger and feel for the sigmoid flexure as it passes over the brim of the pelvis; the colon can be recognised readily by the longitudinal bands and appendices epiploicæ. Pull out now a good loop of the colon; if there is difficulty in doing this from too short a meso-colon replace the loop first caught and take a piece higher up the sigmoid flexure where the meso-colon is longer; with a curved needle pass a strong double sterilised silk suture through the entire thickness of the abdominal wall about one inch from the margin of the wound, through the centre of the meso-colon and again through the abdominal wall, bringing it out at a corresponding point at the opposite side of the wound; remove now the sponge from the interior, and tie the double suture on each side tolerably firmly over lead buttons (see Fig. 8). A single stitch is now passed through either angle of the wound, including the longitudinal muscular band, but not the mucous membrane of the gut; the wound is now covered with boracic acid, taking care to well fill the angle between the gut and the abdominal wall. The operation can now be completed at once by cutting off the protruding portion and suturing the

mucous membrane evenly to the skin all round, or the opening of the gut may be left for a few days until adhesions have taken place. I have never experienced any ill effects from opening at once, and where obstruction is very marked, or if there is much meteorism, it has obvious advantages. If, however, there has not been urgent obstruction the removal of the protruding intestine may be delayed for a few days; and it is very remarkable the absolute insensibility of the gut, the patient being completely free from pain while it is being cut off with a pair of scissors. Absolutely reliable

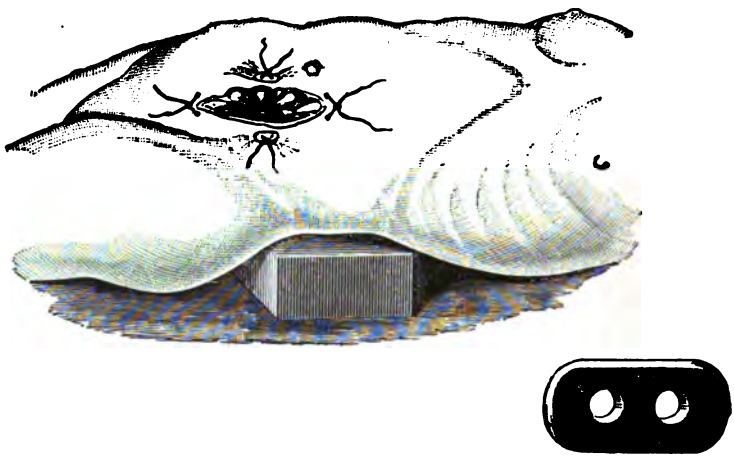

FIG. 8.—Author's method of performing Laparo-colotomy in the left Linea Semilunaris with fixation of the gut by leaded button suture through the meso-colon.

antiseptics are, of course, indicated at all stages of this operation. The after-treatment of laparo-colotomy is similar to that of lumbar colotomy.

Some surgeons have, in the endeavour to still further simplify this operation, used less perfect methods of suturing, or even dispensed with sutures altogether, relying on a pin or probe passed through the meso-colon and resting on the abdominal wall on either side of the incision to retain the

loop of gut. Such a method is highly dangerous, and has been attended with fatal consequences (Kelsey, *New York Medical Journal*, Feb. 18, 1893), hernia of the small intestine taking place beside the colon; while, on the other hand, when not sufficiently secured by suture, the colon has slipped back into the abdominal cavity. If the directions above given are adhered to neither of these accidents could possibly occur, provided the wound is not longer than two inches. If from extreme thickness of the abdominal wall it is necessary to make the incision longer than two inches it would be wise, as a precaution, to pass a few additional points of interrupted suture through skin and mucous coat of the bowel.

Prognosis.—In estimating the probable result of colotomy, it is necessary to carefully classify the cases. Where the operation has been performed for malignant disease, the duration of life can only be prolonged to a certain extent, the disease progressing, and ultimately proving fatal. According to Batt, in 32 per cent. of the cases operated on, death was apparently directly due to the operation when performed for malignant disease; and of 105 that recovered, and whose subsequent history was traced, it was found that six died within two months of the operation, seven died between three and six months after operation, fifteen died between six months and one year, ten died between one and two years, eight died between two and three years, and one died four and a half years after operation. Of thirty-two patients recorded as being well after the operation, only one had survived two years, and one, one year. It is, of course, obviously impossible to form any estimate of how long these patients could have lived if colotomy had not been performed. In my own practice I have performed colotomy sixteen times. For rectal cancer in three cases the lumbar operation was selected; one of these patients lived six months, another three years, and one two years; and in thirteen in which

laparo-colotomy was selected, one lived three years, two, two years, three died during first year, while three died four weeks after operation from extension of disease, the wound being quite healed; four are at present alive.

It has, however, been suggested that this operation has a direct influence in checking the growth of disease. There is in the Hunterian Museum a very beautiful specimen (Fig. 9), No. 2591, taken from a case of colotomy of 30 years' standing, in which the mucosa of the rectum below the opening has undergone atrophy and become villous, these changes being apparently the result of disuse. It is claimed that, as the form of cancer usually found in the rectum is so completely formed of glandular tissue, the abrogation of function of the rectum induced by the colotomy will be followed by atrophy of the morbid growth as well as of the normal structures. I do not think, however, it is safe to draw conclusions as to the result of a certain procedure on a pathological formation from the changes induced in normal structure, as the conditions of growth under the two circumstances are so essentially dissimilar; and the dreary record of early death after operation shows conclusively that the progress of disease in these cases is not to any great extent arrested.

Fig. 9.—Villous condition of Mucous Membrane from a case of Colotomy of thirty years' duration.

That life can be prolonged when death is threatened by

obstruction is of course certain, and probably the diversion of fæces from the surface of the malignant growth, and absolute rest ensured for the part, tend somewhat to retard the growth, and anyone who has witnessed the relief afforded to a person, suffering from obstruction, by this operation will at once admit the complete justification of the procedure. The immediate result is much influenced by the stage of the disease at which the operation is performed; most of the fatal results being due to what Mr. Bryant has truly called "too late" cases.

I believe that the most important evidence that the case is too late for operation is the presence of extensive meteorism. Where the bowel has been hyper-distended it has passed into such an atonic condition that it may be unable to recover itself after an outlet has been provided, and if such should prove to be the case, a rapidly fatal result will probably follow. Extensive meteorism is in itself also a very serious complication to the manipulative details of laparo-colotomy. I recently witnessed an operation under such conditions. The moment the abdominal incision was made, a very extensive prolapse of small intestine took place, which could not be restrained. The recommendation of Mr. Greig Smith was followed, and an incision made in the small intestine, which was then as far as possible evacuated; the incision sutured, and the intestine returned to the abdominal cavity; the colon was now drawn out, and the operation completed; but the patient never recovered power over the intestine, and died in two days. By making a small incision, and immediately plugging this with a sponge, while the further stages of the operation are being completed, prolapse of small intestine can be largely prevented; but in very extreme cases it is well to consider the advisability of substituting the lumbar operation.

Of colotomy for imperforate anus, according to Batt's

statistics, 47·1 per cent. of the cases were successful. Of course when once the patient has recovered from the operation there is practically no limit to the duration of life, as there is in the case of malignant disease already discussed, but the children are frequently ill-developed, and die early from other causes, comparatively few having reached adult life. In the twenty cases operated on for fistula 18 (90 per cent.) recovered. This would appear to point out clearly that the dangers of the operation itself are comparatively trivial, and that the greater degree of mortality of the other classes is mainly due to the damage done by intestinal obstruction. Of the four cases in which the operation was performed for the relief of ulceration three recovered. In these cases the operation should be so performed that when the ulceration healed the artificial anus could be closed. In the few cases in which it was attempted to close an artificial anus the result of colotomy, considerable difficulty was experienced, and although "Dupuytren's spur" is not so marked as in the artificial anus following hernia, it is sufficient to give some trouble. Mr. Barker[a] has suggested an ingenious addition to the means at our disposal for the cure of artificial anus. He introduces into the bowel a piece of flexible rubber sheeting one and a half inches long by five-eighths of an inch broad; this is secured on the internal aspect of the orifice by means of two wire sutures, one at either end; the anus is then closed by paring the edges, and inserting sutures in the usual way, the object of the rubber being to protect the wound from fæces. As soon as the wound is closed the wire sutures can be removed, so allowing the rubber to pass away with the fæcal contents of the intestine. Although in the case given by Mr. Barker this plan did not completely answer the purpose intended, it appears to be well worthy of more extended trial.

[a] Lancet. Dec. 18, 1880.

Cases of Laparo-Colotomy.

Name	Date	Sex	Age	Hospital	Private	Pathology	Opening of bowel	Result	Observations
1. A. T.	Nov. 10, 1884	F.	60	H.	—	Cancer of rectum and obstruction	Immediate	R.	Lived in tolerable comfort for two years
2. T. J.	July 6, 1885	M.	57	—	P.	do.	do.	R.	—
3. R. B.	Oct. 26, 1886	F.	49	—	P.	do.	do.	R.	Lived 18 months
4. A. N.	Nov. 24, 1886	F.	50	H.	—	do.	do.	R.	Lived three years
5. J. K.	March 3, 1888	M.	27	H.	—	Sarcoma filling pelvis; complete obstruction	Immediate in linea alba	R.	Rapid increase; death a month after
6. Mrs. S.	June 4, 1888	F.	45	—	P.	Cancer of rectum; obstruction	Delayed	R.	Lived two years
7. Mrs. W.	Dec. 13, 1889	F.	58	—	P.	Cancer; recto-vesical fistula	do.	R.	Lived 18 weeks
8. P. B.	Nov. 14, 1889	M.	45	H.	—	Cancer of rectum and obstruction	do.	R.	—
9. Mr. B.	Feb. 24, 1870	M.	55	—	P.	Obstruction due to recurrence of rectal cancer (resected)	do.	R.	Only lived four weeks
10. Dr. B.	April 24, 1890	M.	60	—	P.	Recto-vesical fistula	do.	R.	Large calculus with fæcal nucleus removed from bladder 12 months subsequently
11. Miss B.	May 28, 1892	F.	58	—	P.	Cancer of rectum and obstruction	do.	R.	Died of cardiac disease a month after
12. M. F. H.	Feb. 27, 1892	F.	45	H.	—	do.	do.	R.	—
13. Mrs. B.	Nov. 19, 1892	F.	70	—	P.	Complete malignant obstruction	Immediate	R.	Great meteorism and stercoral vomiting at time of operation

The PRESIDENT could not help endorsing the statement of Dr. Ball that in many cases diseases of the rectum are allowed to go on for a very long time without being satisfactorily diagnosticated. He would therefore wish to impress upon younger surgeons the great importance and necessity of careful manual examination. He was not competent to speak very particularly as to operation by removal of part of the sacrum, but in removing rectal tumours he always found less difficulty with their posterior relations than with their anterior ones.

MR. THOMSON said he entirely concurred as to the number of cases coming into the hands of the surgeon when it was too late to do anything for them, the gravity of the symptoms not having been recognised. With regard to the removal of the rectum as compared with colotomy, there was a serious difference in the mortality returns. He thought that excision of the rectum was successful just in proportion as they found the disease low down and easily removable. But when the disease was near the sigmoid flexure and out of the reach of the finger, it required a very serious operation for removal. With regard to the contamination of the wound by fæces, why should they not prevent mischief by diverting the discharge through an opening in the colon? In cases where the cancer was very high up he would first perform colotomy, and when the patient had recovered from that he would then proceed to the removal of the disease. He was also very glad to hear that Dr. Ball insisted on the small incision. He (Mr. Thomson) usually secured the bowel in the cord by a simple pin, which he passed transversely behind the colon and left there for 48 hours. In one operation the time occupied was only 10 minutes.

MR. FRANKS thought that surgeons might approach cases of cancer of the rectum with more confidence than hitherto. If they only got them in reasonable time they might hope that the disease would not return, and in this way he thought it was closely allied to epithelioma of the lip. In proof of this he instanced the case of a lady from whom he removed the whole of the anus and a good deal of the rectum 6 years ago, and she is still leading a perfectly healthy life. He condemned the extremely deleterious treatment of caustics, but concurred with Mr. Thomson as to the necessity of performing colotomy before excision.

MR. THORNLEY STOKER said he cordially endorsed the view that cancer should not be removed except in cases where the tumour was movable. He thought that the operation of proctectomy had

been greatly rushed in late years. The preliminary operation of colotomy in all serious cases of cancer of the rectum recommended itself strongly to his judgment—first, because the danger of septic inflammation might be avoided; and, secondly, it was a question whether, after removal of cancer of the rectum, any fæcal matter should ever be allowed to pass through it again. It was better to ablate the rectum altogether than to attempt to preserve the old passage. He also thought it was a much easier operation in the female than in the male subject. He endorsed the view that colotomy should not be undertaken in every case of cancer, because a certain proportion of cases do not end in obstruction. He thought that the operation of inguinal colotomy would eventually beat the lumbar out of the field. The lumbar one was not only awkward, but it was also much more difficult and dangerous. Besides, the inguinal operation was much more certain, because of the variations which the great bowel is subject to. His own practice is to open the bowel where distension is indicated, in the semilunar line, and not too near to Poupart's ligament, because it would be difficult to wear a truss in that position. He had a special pad constructed which he found very effective in preventing the escape of fæces or fluid. He passes the pin behind the bowel and allowed it to lie on the surface of the abdomen. This forces the posterior wall of the bowel forwards, and forms a spur which is useful afterwards in preventing the discharge of fæces down into the distal portion of the bowel. He had also learned one practical point from Mr. Thomson. That was, to dust the surface of the bowel with iodoform and cover it with guttapercha tissue. Gauze always adhered to the lymph on the bowel, and caused much trouble at the dressing.

Mr. Myles said there were some statements in the paper with which he was forced to join issue. There was great danger, when the bowel was removed by making a section of the sacrum, on account of the whole length of the spinal canal being exposed. They could not divide the 3rd sacral vertebra without exposing the whole canal. If, however, a previous colotomy be performed, and contact with the spinal canal prevented, the operation might possibly be successful. He never yet saw the colon jumping into the wound unless when artificially inflated, and he never saw the sigmoid flexure lying in the position in which it is given in the books. Whether it lies in the pelvis or in the left iliac fossa appears to depend on the condition of the bladder. If the bladder is distended it will be found in the left iliac fossa, and *vice versâ*. He next

referred to the incisions in anterior colotomy, and said, as it was made in the vertical axis of the abdominal muscles, the wound must necessarily gape. He would make his incision parallel to the fibres of the external oblique, which would form an automatic sphincter. He thought that cancer which does not go above the level of the sphincter was an ordinary squamous epithelioma of the skin, and could be easily removed. With great respect, he could not see how anyone could excise the whole rectum through the perinæum.

Mr. Tobin referred to a case of stricture which, in a short time, was cured without the necessity of any operation of colotomy. The patient was taught to wash out the bowel, and the result was very successful. He also advocated the necessity for teaching patients how to use an enema.

Dr. Bennett mentioned a case in which he removed the rectum by means of a transverse incision through the sacrum. The man was in great agony, but had no obstruction of the bowel and no bladder trouble. It was clearly impossible to remove it by perinæal incision, and the hæmorrhage from the middle sacral artery was very little indeed.

Dr. Brooks, in referring to the danger of sepsis, said that the cauda equina extends no lower than the 2nd sacral vertebra. With regard to the semilunar incision, in a certain proportion of cases he found the sigmoid flexure coming up into the opening, and in other cases the small intestine; and by pushing the latter aside the sigmoid flexure could be drawn easily into the wound.

Dr. Ball, in reply, said he was obliged to condense his paper owing to the time allotted, and some of the points omitted were made the subject of discussion. In reply to Mr. Thomson in the first case exhibited, he removed 4 or 5 inches of the rectum for melanotic cancer, and the patient would have certainly died in a few months had he not done so. The second case was one of the glandular form, and he had as yet no opportunity of seeing one of the squamous type. There was a danger in leaving the colon without sufficient sutures, and he much preferred the flexible sutures with buttons to the stiff pins. He believed careful and accurate suturing was one of the most essential elements to success. In reply to Dr. Myles, he said the canal was not opened up, but if they went above the 3rd sacral vertebra paralysis of the bladder was likely to occur. He did not say that the colon ever jumped into the wound. With regard to the incision in the semilunaris, prolapse less frequently occurred than when it was made lower down.

TWO CASES OF DISEASE OF MASTOID AND PETROUS PORTION OF TEMPORAL BONE IN CONNECTION WITH DISEASE OF THE EAR.

By J. P. DOYLE,

Surgeon to St. Joseph's Children's Hospital, Dublin.

[Read in the Surgical Section on Friday, December 9, 1892.]

SINCE my connection with the Children's Hospital, Temple-street, I have frequently seen cases of affections of the ear, but have met with only two in which portion of the temporal bone became very much engaged. In private I operated on a member of our profession for mastoid periostitis, which began in the fauces and extended to the ear. I saw one case in a child who was dying at the time from an abscess connected with the brain from extension of disease of the ear through the temporal bone.

On April the 1st, 1891, a child, aged one year and nine months, was brought to the Children's Hospital, Temple-street, in a moribund condition, for a swelling behind right ear and a profuse discharge from it. This child had been under treatment for three or four weeks at the out-patient department of one of our special hospitals for a discharge from its ear, which it had had for five or six months. The surgeon under whose care it was kindly sent it over to us, as he had no vacancy. The little patient was in a very emaciated and collapsed state, having constant vomiting, cough, paralysis of right side of face, and some congestion of lungs. The finger, on pressing the abscess behind the ear, at once slipped into a cavity in the bone, and you could nearly empty the abscess through the

external ear—the pus streamed out. It was very offensive, thin, and of a greenish hue. Having opened the abscess and cleansed the parts with an antiseptic solution, I had to desist from further measures, owing to the child nearly dying on the table. The following morning I removed portions of loose bone that lay in the cavity, one portion being nearly half an inch in diameter. The child progressed favourably until the following Sunday, April 5th, when, after a visit from her mother, she became greatly excited, the vomiting returned, and on April 11th she passed quietly away. All through her intellect appeared unimpaired.

On removing the scalp over the position of the abscess (specimen exhibited) a circular opening half an inch in diameter was found behind and partially above the right external auditory canal which leads directly inwards and forwards through the internal and middle ear. This cavity communicates at the junction of the squamous and petrous portions of the temporal bone with the middle fossa of the cranium by an irregular aperture about a quarter of an inch in diameter. The dura mater along the outer, anterior, and posterior borders of the opening was detached. The centres of the under-surface of the inferior and middle convolutions of the right tempero-sphenoidal lobe which corresponded with the inner opening in the bone were superficially soft and abraded. The other portions of the brain appeared healthy. A quantity of serum escaped on incising the dura mater. No portion of the semicircular canals, middle or internal ear, remained, nor could I find any trace of the facial nerve in this portion of its course, but a structure which looks like it can be seen passing through the position occupied by the stylo-mastoid foramen.

When this case first came under observation the external opening in the bone was larger and more irregular. Owing

to the reparative changes that took place it had diminished in size, and the margins had become smoother. It now has the appearance of a trephine hole.

There is at present in St. Joseph's Hospital a fair-complexioned, delicate boy, aged two years, upon whom I operated on the 10th of September last for mastoid periostitis and caries of petrous portion of right temporal bone. He has paralysis of facial nerve of same side, with contraction of pupil and convergent strabismus of right eye. This child had a chronic discharge from the ear for twelve or thirteen months prior to admission, and had some aural polypi removed at a special hospital, but they always returned. In January last he had multiple abscesses and disease of bone of last phalanx of left middle finger. The opening I made over the mastoid process communicated freely with the middle ear, and with the external meatus through a fistulous opening in the posterior bony wall at the point from which the polypi sprouted. The periosteum was detached from the mastoid process; the base felt rough, and was so hard that it was with some difficulty it could be penetrated.

The hard condition of the mastoid portion of the temporal bone that exists in this case has been described by some authorities as a subacute condensing osteitis, which is said to depend on prolonged inflammation of the antrum and middle ear, which causes the mastoid and other cells or spaces to gradually fill up with bone substance. The mastoid cells in young children are very slightly developed.

There was not much difficulty in carrying out the operative measures required in these cases. In making Wilde's incision in cases of mastoid periostitis, it is as well to begin the incision below, and feel that you are well on the mastoid process—it is surprising how deep you have sometimes to go before you strike it.

As regards trephining the mastoid process, the subject has been so often before you for discussion that I have little to add, and it would seem presumptuous on my part to allude to the treatment of affections of the ear in the presence of so many competent members of this Section.

In the majority of cases so many factors enter into the causation of suppurative disease of the middle ear besides constitution, environment, and the various micro-organisms, that it would require an unnecessarily long paper to discuss them all. In some cases it is affections of the teeth and tonsils, in others of the nares or naso-pharynx, which you have to attack before you succeed in curing or ameliorating the ear trouble. However, by perseverance and attention to the various details of treatment, you can, in most instances, bring your case to a favourable termination.

A great advance has been made in the treatment of ear, throat, and nasal affections by the use of sprays and antiseptic remedies, and by removing the causes of obstruction in the fauces, pharynx, and nares.

In children, when you find any disease in the fauces or other passages in connection with a discharge from the ear, it is as well to administer an anæsthetic and thoroughly examine the nares, and dilate or remove any granular or other conditions of these parts or pharynx. I generally find you can clear the roof and back of pharynx at one sitting, using the curette or forceps through nares or mouth. In children, owing to the want of room and narrowness of the fauces, it is more satisfactory in many instances to remove slices from the tonsils, if enlarged, with a curved scissors instead of using a tonsillotome.

A CASE OF SUCCESSFUL LIGATURE OF THE INNOMINATE ARTERY.

By CHARLES COPPINGER, M.D., F.R.C.S.;
Surgeon to the Mater Misericordiæ Hospital.

[Exhibited in the Section of Surgery, February 24, 1893.]

Mr. Coppinger exhibited a patient on whom ligature of the innominate artery had been performed six weeks before. The case excited much interest, and, at the request of the President, Mr. Coppinger gave a brief account of the patient.

The man exhibited was aged fifty-three, and had suffered from a large aneurysm of the second and third stages of the subclavian artery. He had endured excessive pain for many months. The aneurysm was growing quickly, pulsating strongly, and apparently about to burst. Under these circumstances, and to save his life, the innominate was ligatured, and the carotid at the same time divided between two ligatures. The result so far was satisfactory, for, although the aneurysm was still very perceptible as a large soft tumour in the patient's neck, it was entirely without pulsation, while, moreover, no pulse could be felt in either his right wrist or arm.

The patient was now shown, six weeks after operation, as the first successful case of ligature of the innominate ever exhibited at any medical society in Europe.

Mr. Coppinger stated that he hoped to be able to show this patient at a later date as a case of cure of subclavian aneurysm by ligature.

Dr. Myles said he did not exaggerate in saying that every member of the Academy was delighted and gratified by the success that had attended Mr. Coppinger's operation.

Mr. Swan said it was of extreme interest indeed to the members of the Academy to have so remarkable a case before them. The case of Mr. Coppinger was a record in surgery not alone in Ireland, but in the whole world.

Mr. W. Thomson said he desired to join in the congratulations that had been offered to Mr. Coppinger upon what he regarded now as a successful result. He took an especial interest in this case, because he himself had gone through all the torture of failure when he thought he had obtained success. In the book which he wrote on ligature of the innominate, he said very emphatically that if such another case came before him he would not hesitate to operate, because he believed the operation was one which must be successful. There were more difficulties at that time in the method of dealing with wounds, and he lost his case by the prolonged use of the drainage tube. In Mr. Coppinger's case there was an opportunity given for the rapid adhesion of all parts of the wound, and to that, with division of the carotid, he attributed the success which had followed. In his own case there had been suppuration in the wound, and it remained open for a considerable time. These conditions were absent in Mr. Coppinger's case, and they had a result upon which they were justified in congratulating him. He would not like to suggest any possibility of failure, but Mr. Coppinger knew that there were difficulties which might arise at this stage. He, however, regarded the case as one of complete success, and he thought it was a matter upon which the Dublin School of Surgery must be congratulated. They had now the first uncomplicated successful case on record, as well as one that had been nearly successful.

ON THREE CASES OF ENTERECTOMY AND ENTERRORHAPHY.

By KENDAL FRANKS, M.D. Univ. Dubl.;
Fellow and Member of Council, Royal College of Surgeons, Ireland;
Surgeon to the Adelaide Hospital.

[Read in the Section of Surgery, Friday, May 12, 1893.]

The abdominal cavity has for many years afforded a fruitful field for surgical enterprise. No organ contained within its walls is too awe-inspiring or too sacred to escape the sacrilegious hands of surgery. They are enclosed and protected by a membrane which was formerly regarded with reverence and dread. The peritoneum has now lost many of its terrors. It is opened with as much *sang froid* as in former days it excited misgiving and fear. We have learned to treat it humanely; to protect it against those dangers which modern science has taught us to avoid; and we have found that our confidence in it has not been misplaced. It has been shown repeatedly that every abdominal viscus can be dealt with successfully. Either entire organs or parts of organs have been removed without injury to the organism as a whole. The hollow viscera form no exception.

It has long been known that portions of the intestine may slough away, as a result of strangulation in hernia, and the patient recover. Sir Astley Cooper has excised a gangrenous loop twice, and Ramdohr successfully removed a piece of intestine in 1727, and subsequently restored the continuity of the canal by a process of invagination. But on account of the inherent risks of the operation, the danger of peritonitis, the difficulties of efficient suture, and, consequently, the high mortality in the pre-antiseptic era, the operation was only attempted sporadically by the more daring spirits,

and was not, until within the past few years, classed among the category of legitimate surgical procedures. The operation of excising a portion of the intestinal canal (enterectomy), and of suturing the divided ends together so as at once to restore the continuity of the canal (enterorrhaphy), is now very frequently performed, and with an increasing proportion of success. In this country surgery has not been behind in this respect. In 1886 Mr. M'Ardle performed pylorectomy for the first time in Ireland. It was again performed in 1889 by Sir William Stokes, and I am indebted to him for the privilege of having been present at the operation. Unfortunately both patients died. The Academy will also remember a very interesting paper by Mr. M'Ardle, in 1887, on enterectomy and enterorrhaphy, in which he related the case of a boy, aged sixteen years, from whom he excised a piece of the ileum, about 6½ inches in length, half an inch from the ileo-cæcal valve. Enterorrhaphy was performed, and the boy made an excellent recovery. At the time of the operation the vermiform appendix was excised and closed by three Lembert sutures, and an opening in another coil of intestine, where a fistulous opening had existed between it and the diseased ileum, was freshened and sutured.

Quite recently Dr. W. J. Smyly has recorded in a paper, read before the Obstetrical Section of this Academy, the case of a woman suffering from ileo-uterine fistula. From the character of the fæces, and the history of the case, it was evident that the uterus had ruptured during labour, and that a coil of small intestines had become strangulated in the rent. He says:—"Upon opening the abdomen, I found a loop of the ileum attached to the lower part of the posterior surface of the uterus. Having detached it and brought it out of the abdomen, it was found necessary to resect about two inches of the damaged portion; the divided ends were closed, and the intestinal canal restored by anastomosis, by

means of bone plates. She made an excellent recovery, and when last heard of was working in the fields."

I am not aware of any other cases in this country in which a portion of the intestinal tract has been resected and the divided ends immediately sutured together, except three which I have performed at the Adelaide Hospital, and which I desire to lay before the Academy in the hope that, together with the cases to which I have referred, a nucleus may be formed, round which other cases will be gathered, forming a record which may hereafter compare favourably with the work done in intestinal surgery in other countries. The first case has already been published elsewhere,[a] and I shall therefore only refer to it summarily :—

Case I.—The patient was a man, aged fifty-eight, of very temperate habits, and with a good family history, who was admitted into hospital under my care on Oct. 19th, 1888. He had been in good health until Oct., 1887, when he had severe attacks of diarrhœa, accompanied with pain in the epigastrium, whenever he ate beef or mutton. These attacks used to last for about a day, and were followed by constipation, which continued sometimes for ten days or a fortnight. Under medical treatment he improved, and was free from his former trouble for three months. The symptoms then returned, but the previous remedies failed to relieve him. He was obliged to restrict his diet to gruel, potatoes, bread and butter, and fish. A fortnight before I saw him, one night as he was getting into bed he noticed a hard lump in the abdomen, which "seemed to fall backwards when he lay down." He was a thin man, with a sallow, cachectic aspect, suggestive of malignant disease. On examination I found in his abdomen—which was soft and flaccid—a very hard, nodulated tumour, about the size of a large orange, which lay in the middle line just below the umbilicus. It could be manipulated without producing pain, and was freely movable in every direction except downwards, in which direction its range of motion seemed more limited. The diagnosis made was a tumour, probably malignant, of the omentum; but on account of the intestinal trouble I considered it was likely that the

[a] Trans. Medico-Chirurg. Society of London. Vol. LXXII. 1890.

intestine was involved, and accordingly I made preparations for dealing with the intestine previous to the operation, which took place on Oct. 30th, 1888. An incision, about 4 inches in length, was made in the middle line below the umbilicus in the usual way, and the abdominal cavity was opened. The tumour, which was found lying underneath the liver, was drawn out through the wound, and proved to be a malignant growth about the size of the closed fist, growing from the hepatic half of the transverse colon, which ran through the middle of it. The omentum, which consisted merely of a connecting band between the stomach and colon, was partially infiltrated, as was also the mesocolon, between the layers of which some enlarged glands, about the size of beans, could be felt. Resection was immediately performed. The tumour, with the involved portion of intetines, being well drawn outside the abdomen, was surrounded by two large flat sponges, clamped together by means of Wells' forceps, so as to shut off the field of operation as much as possible from the serous cavity beneath. The colon, on each side of the tumour, was encircled by a piece of catgut about two inches from the growth, and each of these was tied just tight enough to occlude the bowel without interfering with its vitality. The colon on each side was then divided with scissors. The great omentum was ligatured bit by bit close up to the stomach above and to the colon below, and divided between them to an extent corresponding to the portion of the colon to be removed. A wedge-shaped piece of the transverse mesocolon, which was involved in the disease, was excised; all affected glands between its layers were removed. The sides of the triangular cut in the mesocolon were then approximated by means of interrupted catgut sutures, and the ends of the colon thus drawn together. The ends of the bowel were then sutured together by means of fine silk passed according to Gély's plan—that is, a single row of sutures were passed parallel to the circumference of the gut, transfixing only the peritoneal and muscular coats. As each suture was passed it was knotted. When the intestinal suture was completed the colon was replaced, and the abdominal cavity was cleansed by pouring in a quatinty of boracic acid solution at blood-heat, which was allowed again to pour out by turning the patient on his side, and the remainder was removed by careful sponging. The abdominal wound was then closed, and the patient was sent back to his bed. The operation lasted two hours. The length of colon removed measured five inches. On

microscopical examination the growth proved to be a cylindrical epithelioma.

On the sixth day there was a copious evacuation from the bowels, and on the ninth day he was allowed solid food by the mouth.

It is now nearly four years and a half since the operation was performed, and the patient is still in the enjoyment of perfect health in the west of Ireland.

Case II.—The second case was that of a man, aged forty-eight, who was admitted to the Adelaide Hospital on October 17, 1889, for extensive ulceration of the leg, due to varicose veins. He suffered frequently from constipation, and required large doses of medicine to affect the bowels. On December 30th, early in the morning, he was seized with violent abdominal pain about the umbilicus, and radiating from it. The next day vomiting set in and persisted. The pain came on in paroxysms, and was agonising. The bowels were absolutely confined, neither fæces nor flatus passing after the first day. After consultation we decided on performing an exploratory laparotomy. The abdomen was opened in the usual way on January 4th, 1890. We then found that the immediate cause of his trouble was volvulus of a coil of the small intestine in the left hypochondrium. This coil for several inches was in a condition of gangrene. The mesentery belonging to this portion of the intestine was thick and œdematous, and we found all the veins in it completely thrombosed. They felt like cords running through the mesentery, and evidently were not the result of recent disease. We were quite unable to account for this condition. It was evident, however, that, in spite of the serious condition of the parts, something should be attempted to relieve him of the intestinal obstruction. I accordingly determined to perform resection of the gangrenous intestine, and by immediate suture to restore the continuity of the canal. The bowel being held firmly by the fingers of my assistant, I cut it across with a pair of strong scissors both above and below the affected portion. Sixteen inches of the gut were thus removed, together with a wedge-shaped piece of mesentery. The edges of the mesentery were first united together with a continuous catgut suture, and then the intestinal ends were brought together by means of Gély's suture passed as in the former case. The abdominal wound was closed in the ordinary manner after the "toilet" of the peritoneum

had been accomplished. The patient recovered fairly well from the anæsthetic and from the shock of the operation. The next morning he informed me that, even if he did not recover, the relief he experienced was well worth the operation he had undergone. Everything then promised well, but during the night symptoms of obstruction again appeared, and he died on January 6th, two days after the operation. A *post-mortem* was made the following day by Dr. Bewley. It was then found that the lower portion of the bowel, below the line of suture, was becoming gangrenous. The bowel was almost impervious at the line of suture, but whether this was the result of tying the stitches too tightly, or was due to the œdema accompanying the gangrene, we could not easily determine. I am inclined to think that the latter was probably the main cause, as the symptoms of obstruction did not recur for 36 hours after the suture had been applied. This was the immediate cause of death. The primary cause was due to a very remarkable and, I believe, unusual condition of thrombosis. At the autopsy we discovered that not only were the veins throughout a large piece of the mesentery completely occluded by old blood clots, but the same condition existed in the portal vein. An old firm blood-clot was found extending through its whole length, and so filled it as to leave only a minute channel beside it for the passage of the blood. We were unable to ascertain the cause or origin of this state of the veins, but to it was unquestionably due the gangrene of the gut, and the volvulus we found was, I believe, the result of this gangrene. There was no leakage from the site of suture.

I do not think we can justly lay the fatal result in this case at the door of resection. I think from the condition I have described it is evident that death would have resulted in spite of any treatment which might have been adopted.

Case III.—The third case was that of a woman, aged thirty-six, who was admitted to the Adelaide Hospital on the 22nd September, 1891. About three months previously she noticed a small swelling at the umbilicus, which came on after lifting a heavy weight. The swelling was easily reducible into the abdomen without the least trouble or pain. She consulted a lady friend, who gave her an abdominal belt, which she had worn for a month before I saw her. During these three months she had suffered

much from headache, and complained of a good deal of tenderness over the abdomen, which she thought had enlarged.

At 4 a.m. on the morning of the 22nd of September, she awoke suddenly with a violent pain in the abdomen, and putting her hand down she discovered a large hard swelling at the umbilicus, which she tried in vain to reduce. Vomiting soon set in, and was frequent. Dr. Jones, of Rathmines, saw her about 11 a.m. He at once recognised the urgency of her case, and sent her into the Adelaide Hospital, where she arrived at 2 30 p.m. I saw her at 5 o'clock, and found her in the following condition:—She was a fairly well-nourished, healthy-looking woman, but she appeared to be in a very excited state. Her face was very flushed, and wore an anxious expression. She seemed to be in great pain, which she referred to the abdomen. Her tongue was furred; she did not appear to be at all collapsed. Her pulse was full, regular, and non-compressible; the temperature was normal. Her breathing was rather shallow, and she complained of its being difficult. She stated that she had had an action of the bowels the previous morning, but none since then. The urine was acid, s. g. 1030; urates were abundant, but no albumen or sugar. On examination I found that the abdomen was uniformly enlarged, and sufficiently tense to prevent any examination of the contained organs. On percussion the flanks gave a dull note; the rest of the abdomen was tympanitic.

At the umbilicus there was a tumour about the size of an orange; it consisted of two parts—the upper one small, with a raised rim, depressed in the centre, immediately corresponding to the umbilicus. It was of a reddish colour, evidently acutely inflamed. The lower one, larger and a little to the right side, was globular, extremely tense, and was of a bluish black colour. It was hard, very tender to the touch, and firmly gripped at the base. A hard, ring-like mass could be felt encircling its base. No impulse on coughing. The abdomen generally could be manipulated gently without pain, except in the immediate neighbourhood of the tumour. The patient was given a sixth of a grain of morphia at 4 p.m. and again at 11 p.m. She vomited a few times during the night, but it was not stercoraceous; she slept at intervals.

Next morning, September 23, at 10 15 a.m., 30¼ hours after the onset of the symptoms, the patient was placed under an anæsthetic by Dr. Piel with his usual skill, and assisted by Mr. Heuston, I proceeded to operate. I made a median incision directly over the

tumour, and when the skin and fascia had been divided, a loop of small intestine was exposed. It was deeply congested, and at one place was quite black. Several constricting bands were successively divided, and the smaller tumour upwards and to the left was opened. It appeared like a small pouch, and contained a small portion of intestine. The umbilical ring was very thick, almost cartilaginous. When it was divided, the circulation gradually returned to the greater portion of the intestine, but the black portion seemed to be quite unaffected, and was evidently beginning gangrene. After a short consultation we determined to perform enterectomy—in the first place, because the intestine seemed incapable of recovery; and secondly, because the portion involved belonged to the jejunum, and an artificial anus, if established, would only postpone a fatal issue.

Accordingly I proceeded first to enlarge the original opening at the umbilicus by incising the tissues downwards towards the pubes for about three inches. This was done in order to be able to draw out the intestine so as to have sufficient room for suturing. When the abdominal cavity was thus exposed, a quantity of semi-gelatinous clear fluid escaped from the wound. It was so abundant that it was impossible to proceed with the operation until the greater portion of it had been removed. I inserted my hand then through the wound to ascertain the cause, and discovered that there was a fairly large ovarian tumour, about the size of a fœtus at full term, attached by a very broad pedicle to the broad ligament at the left side. It was a multi-locular semi-solid cyst. We determined to leave it alone for the present. We considered that the length of time necessary to resect the intestine and to suture the divided ends, together with the inherent dangers of such an operation, constituted a sufficient amount of risk in themselves without exposing the patient to the danger of prolonging the operation, and of adding to it the risks of an ovariotomy.

When a sufficient amount of the glairy fluid had been got rid of to allow us to proceed with comfort, the congested loop of intestine was drawn well forward, and then the abdominal cavity was shut off from the field of operation by means of two large flat sponges, placed one on each side of the loop of intestine, and clamped together with forceps, both above and below the loop. I determined to divide the intestine where it was healthy—that is, above and below the congested portion. Nine and a quarter inches of the gut had thus to be sacrificed. Before the intestine was divided

the lumen of the bowel, both above and below, was occluded by means of Mr. Heuston's fingers. No clamp was employed. This method of securing the field of operation against the risks of fæcal contamination proved eminently convenient and satisfactory. The intestine was divided, first above and then below, with scissors, and a wedge-shaped piece was, at the same time, cut out of the mesentery, the divided vessels being secured. The next step in the operation was to sew up the mesentery, which was done by means of a fine catgut continuous suture. Great care was taken to close accurately the triangular spaces where the mesentery divides to enclose the gut. The method employed was this:—A suture was passed through both layers of the mesentery, close up to the intestine on one side, and then passed similarly through both mesenteric layers on the other side and firmly tied. This not only obliterated the triangular spaces, but helped to fix the divided ends of the intestine together. The remaining portions of the intestine were united by means of fine silk (Chinese twist) passed according to Gély's plan of suturing the intestines. The suture picks up only the peritoneal coat. It is passed in the following manner:—A long fine piece of silk is armed at each end with a fine needle. One of these needles is passed through the peritoneal coat of the upper end of the divided intestine, about $\frac{1}{4}$ of an inch from the edge, and passing parallel to the divided edge beneath the peritoneum, emerges again at a point about $\frac{1}{4}$ of an inch from the point at which it entered. The second needle enters the peritoneum covering the lower end of the divided gut, at a point exactly opposite to the point of entrance of the first needle, and emerges at a point exactly corresponding to the point of emergence of the first needle. When the silk is drawn tight the edges of the intestine invert, and when accurately co-apted the suture is tied in a knot. The needles are then passed in again, starting from the knot, and each needle picks up another quarter of an inch of peritoneum on each side, and the suture is again tied. This process is repeated until the whole circumference of the bowel has been dealt with. It will thus be seen that the suture is a continuous suture, but interrupted at every point of emergence and entrance by a knot. I closed the last portion of the intestinal wound with three Lembert sutures. The parts were then thoroughly cleansed and replaced in the abdominal cavity, where they lay upon the upper portion of the ovarian tumour. As much as possible of the glairy fluid in the abdominal cavity was drained off and some of it sponged out.

The abdominal wound was then closed, a glass drainage tube being passed down through the upper part of the wound. Sal alembroth dressings were employed. The patient did not appear at all collapsed after the operation; she had a good colour, and the pulse was excellent, when she was restored to her bed. At 1 p.m. she got, hypodermically, $\frac{1}{6}$ gr. of morphia, and was allowed a little ice to suck. The morphia was repeated at midnight, after which she had a good night.

I need not weary you by detailing all the particulars as to the daily treatment and progress. Suffice it to say that she was allowed one teaspoonful of white wine whey every two hours from the first day, and a zymine suppository was administered every sixth hour, and the urine was drawn off regularly. She was dressed for the first time the morning following the operation (Sept. 24th). The dressings were pretty well saturated with discharge, and by means of a syringe and indiarubber tubing $8\frac{1}{2}$ ozs. of thick yellowish fluid were sucked up through the glass drainage tube. The next morning the dressings were again saturated, and $4\frac{1}{2}$ ounces were sucked out. On the fourth day, as no fluid could be sucked up through the glass tube, it was removed. The wound healed throughout by first intention.

No food was given by the mouth excepting the teaspoonful of whey and a little brandy and water until the evening of the 27th, when she got a teaspoonful of Denaeyer's peptonised meat. On the 28th—that is, the sixth day—she got ℥iv. of milk every four hours, and a teaspoonful of the peptonised meat every eighth hour. On Oct. 1st (the ninth day) she got some tea and toast. Nutrient enemata and zymine suppositories alternated every fourth hour during this period, and were finally abandoned on *Oct. 5th, the 13th day*, when *she was allowed solid food by the mouth.*

During this period the patient was troubled a great deal with flatulency, but otherwise her progress left nothing to be desired. The day following the operation she passed some flatus, and again on the morning of the fourth day. On the fifth day she got an enema of warm water, which came away immediately with scarcely any fæcal matter, but the bowels moved again five hours later slightly, the motion being fluid. The bowels acted once or twice a day from this onward.

On the 27th of October, five weeks after the performance of the enterectomy, the patient was in such a very satisfactory condition of health and strength that I considered it would be unwise

to delay further the removal of the ovarian tumour. My chief fear was that if I delayed any adhesions which had formed would become organised and firm, and would materially increase the danger to the patient—especially as these adhesions would form between the sutured intestine and the tumour.

Accordingly, the patient being prepared in the usual manner, and placed under anæsthesia, an incision was made from the umbilicus to an inch above the pubes, and when the peritoneum was opened, there was a copious discharge of the same thick, gelatinous-looking fluid as at the former operation. The tumour at once appeared. The largest cyst was drained through a Lawson-Tait's cannula, then the wound in the cyst-wall was enlarged sufficiently to enable me to introduce my hand, and by this means to break up the numerous cysts of which the tumour was mainly composed. At last the tumour was sufficiently reduced in size to enable me to draw it out of the abdominal cavity. There were a great number of soft adhesions, which readily yielded to the fingers. The tumour was attached by one broad pedicle to the broad ligament on the left side. There was also a broad strong adhesion, binding it down to the right side of the pelvis, almost constituting a second pedicle. Both of these were transfixed and ligatured in sections, and were then cut across on the side of the tumour. When it was ascertained that there were no bleeding points the abdominal cavity was well flushed out with warm boracic acid solution (4 per cent.) and carefully sponged dry. I then sought for the sutured intestine; it was impossible to detect it with the eye, but I soon recognised it by touch. The line of union was so perfect that not even a contraction or depression on the surface marked the line of suture, but with the fingers a considerable thickening beneath the smooth surface of the peritoneum could be felt. When we had all inspected it, the abdominal wound was closed in the usual manner. The subsequent progress requires little comment. Suffice it to say that on the 14th day (Nov. 9th, 1891) the patient was allowed upon the sofa, and a fortnight later she left hospital perfectly recovered. I had an opportunity of examining her six months later. The abdomen was perfectly flaccid, soft and natural. She was in perfect health, except for occasional twinges of abdominal pain, probably due to flatulence.

A point of great interest in this last case, and one of exceptional occurrence, was the opportunity we had of

examining the sutured intestine in the living state five weeks after enterorrhaphy had been performed. I do not think a better proof could have been afforded us of the value of this method of treatment than *seeing* so clearly the perfect union which nature had accomplished after suture—a union so perfect that to the eye it almost defied detection.

Another point in connection with this case deserves comment. It is generally supposed that the method resorted to in this case—namely, resection and immediate suture in gangrenous hernia—is an ideal method, a brilliant and showy operation, but one which exposes the patient to a great and immediate risk, and therefore one to be, as a general method of practice, condemned by prudent surgeons, and discarded in favour of the older, the easier, the less brilliant, but the safer method of establishing an artificial anus. Now this is not the case. I have recently investigated the statistics of these procedures. I have collected the records of gangrenous hernia treated in various hospitals by the formation of artificial anus, and I have also collected all the published cases of gangrenous hernia in which resection and immediate suture have been performed.

The details of this investigation will be published elsewhere, but the general result I may shortly state. The mortality which follows the formation of artificial anus, when undertaken for the relief of hernia in which the bowel is gangrenous, gives the very high percentage of 80·7. On the other hand, I have collected 222 cases in which resection and immediate suture have been resorted to, and I find that the death-rate is only 48 per cent. Hence the more ideal operation, that which endeavours to restore most perfectly the *status quo ante*, is also by far the safest for the patient.

Time will not permit me to discuss the many interesting points which these cases as a whole suggest. I will merely

state some conclusions to which my experience in these cases has led me:—Firstly, as to the method of suture. In all three cases I employed Gély's suture, a suture which, being continuous, is more rapidly applied than the interrupted Lembert, and I have found it answer remarkably well. I am not, however, so wedded to it as not to think that a *continuous* Lembert would answer at least as well. The precise method of suture which we adopt is, I believe, a matter comparatively of little importance. Two points, I submit, are of paramount importance. One is that we must regard that form of suture as best which, with due regard to efficiency, can be most rapidly applied. In enterectomy followed by enterorrhaphy, time is a matter of the utmost consideration. The other point is that we should always suture in healthy tissue. It matters very little if we remove a few inches more than is absolutely necessary. Statistics have absolutely demonstrated the truth of this, but they have also shown how fatal it is to remove one inch too little. Therefore, in enterectomy the best plan is to remove everything which is suspicious.

It will be observed that in my three cases I did not use a clamp to control the intestine. I relied, with confidence which was not misapplied, on the efficient control of the gut by the fingers of the gentleman who assisted me. Digital compression is far superior and much simpler than any form of clamp, and I am glad to know that so great an authority as Mr. Treves, who has himself devised a clamp, thoroughly endorses this view.

In conclusion I would observe that however admirable the technique may be which we employ, however great the dexterity of the operator, failure is sure to be the reward of procrastination. If, Micawber-like, we wait to see what will turn up, patients, whose lives might be saved by timely intervention, will assuredly drift into the vortex from which

no tardy repentance or vain regrets on our part will avail to recall them. In conclusion I would say,—

> "If it were done, when 'tis done, then 'twere well
> It were done quickly."

The CHAIRMAN said they were all of one mind in considering the communication they had just heard as one of great surgical importance. With regard to the operation of pylorectomy which Dr. Franks has alluded to, he said that the prolongation of the operation was mainly due to the sutures that were employed. He thought that if means were devised by which the intestines could be sutured more rapidly the great shock, which in many cases was the cause of death, would be avoided. He agreed with Dr. Franks in reference to the superiority of the fingers over the clamp, because the latter must be applied with such an amount of force as could not be often properly measured. He thought too much praise could not be given to Dr. Franks for the industry he had shown in collecting the statistics of those 222 cases. An important surgical question that occurred to him was whether, in the event of finding that gangrene had taken place, they should perform resection at the site of strangulation, or whether they should perform laparotomy, and thus be enabled to see how far any infiltration had taken place. He was sure that in a large number of the cases in which the operation had been fatal, death was due to not having excised the infected portion of the gut. He thought the probabilities were that in the future they would open the abdomen and perform laparotomy, and do a much larger excision than at the seat of the gangrene. He thought too much importance must not be placed on statistics, because cases of strangulated hernia were very much more favourable than they used to be, and in some cases the gut may not have been really gangrenous at all. Where the bowel was actually gangrenous, he thought the chance of recovery would be far better by opening the abdomen and getting a full view of the seat of the lesion than by performing an operation at the seat of strangulation.

MR. SWAN remarked that the increased success of abdominal section, for all classes of visceral lesion, would cause surgeons in future to modify their treatment of strangulated hernia. He referred to a case of femoral hernia in which taxis failed and

symptoms of acute obstruction set in. He opened the abdomen; and with the greatest ease drew the knot of intestine out of the ring, and at the same time performed the radical cure by stitching the pillars of the ring together. The case made an excellent recovery. The explanation of the facility with which the hernia was reduced was easy to demonstrate. When a hernial protrusion is pushed against a small aperture, the transverse diameter of the protrusion is increased; whereas, if the part is withdrawn from behind, there is the greatest facility for its escape. He thought that the cases mentioned would lead them to open the abdomen, which would be the most advantageous method in cases where there was gangrenous mischief in the gut.

Dr. Ball said that Dr. Franks had gone so very fully into this important and difficult subject that there was very little room for discussion. He saw that Mr. Lawson Tait advocated laparatomy, not alone in all cases of strangulation, but also in all cases for the radical cure of reducible hernia. He saw Mr. Tait perform this operation some years ago, and certainly the ease with which it was reduced was very remarkable.

Mr. M'Ardle said in reference to his case of pylorectomy the delay in suturing was primarily the cause of collapse, and the operation lasted for an hour and a half. He referred to a case of Mr. Tait's, where after cutting down upon a femoral hernia he found it impossible to reduce the hernia, but the slightest amount of traction after doing median laparotomy resulted in drawing in the bowel with the greatest readiness. He thought, however, that when the bowel is gangrenous there is danger of infecting the peritoneum, and secondly there was danger of lacerating the bowel in their efforts at traction. He agreed with Dr. Franks as to the value of immediate resection, because they had no conception of how high the gangrene might occur. He thought septic intoxication very likely to occur from artificial anus. He considered the new anastomotic plates brought out by Dr. Murphy for suturing the intestines together much better than the plates of Senn, as too much time was spent in placing the latter plates in position. He likewise did not like to use the continuous suture, as it was likely to produce necrosed spots in the bowel. These plates had been described by Dr. Murphy as reducing the length of the operation from one and a half hours to half an hour, and in that case he thought they would be more fortunate in their pylorectomy operations. They only required to pass a strong suture round the mouth

of the bowel and the plates fitted into position. He agreed with Dr. Franks as to the evil result of procrastination, and he was glad to see him so strongly advocating the immediate resection and suture of the intestines.

Dr. Franks, in replying, thanked the members of the Academy for the extremely kind way in which they received his paper. With regard to Mr. Swan's treatment of strangulated femoral hernia, he himself tried that method in one case, and was surprised at the extreme ease with which the intestine came out. It also has the advantage that if the intestine is gangrenous you can deal easily with it. In the two cases of gangrene of the intestine which he detailed, it would be observed that in the first case he did not know that there was gangrene to deal with, and laparotomy was done as an exploratory operation. In the second case the strangulation was at the umbilicus, and this was a most favourable position for excision. He thought that in laparotomy where the hernial sac was laid open, they might leave behind a peritoneal pouch which was full of septic material, and they would be extremely likely to expose their patient to septicæmia. He would prefer to do the ordinary herniotomy at the seat of gangrene, and after having cleared out the hernial sac, then open the abdomen as a secondary operation, and do resection and suture through the abdominal wound. He agreed with Mr. M'Ardle as to the danger in these cases if you operate at the ring and not resect sufficient intestine. He never used Senn's plates, because he thought as much time could be saved with the continuous suture, and the plates have very often led to stricture of the intestine. With regard to the statistics, he would be entirely in accord with what had been said by Sir W. Stokes. However, they found that in ordinary herniotomy where the gut was healthy the mortality was 40 per cent.; he believed that the large mortality was due to the return of what looked comparatively healthy gut into the abdomen, but which was in reality diseased. The mortality was only 48 per cent. in cases of resection for gangrenous gut, and he thought that this spoke volumes for this operation. He said the mere percentage of deaths in cases of artificial anus was 80 per cent., whereas Mikulicz, of Warsaw, who performed 21 resections had 14 successes. He thought, therefore, that cases which die of artificial anus would be saved if resection had been performed.

NOTES OF TWO CASES OF CEREBRAL SURGERY.

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[Read in the Section of Surgery, May 12, 1893.]

It is, I think, in the present state of brain surgery, of importance to place on record all cases tending to throw light on cerebral localisation of disease and the operative treatment had recourse to. I beg therefore to bring forward two additional cases—one of Jacksonian epilepsy, the other of large abscess in the temporo-sphenoidal lobe. For the notes of the former I am indebted to Mr. Dixon, and for the latter to Dr. Kiddle:—

Case I.—A. C., aged thirty, a fitter, December 24, 1890, fell on his head a distance of 14 feet, alighting on some stone flagging. He was admitted to hospital with a scalp wound about 4 inches long, over right occipital and posterior parietal regions. He was unconscious; no fracture could be detected. For a fortnight he remained dull and listless with paralysis of the sphincters, and subsequently became maniacal; he, however, apparently completely recovered, and was discharged on January 27, 1891. Nine months subsequently he was admitted again to hospital with twitchings of left hand and arm, and partial left facial paralysis, but left after five days in hospital.

On December 29th, 1891 (a year after the injury), he was re-admitted to hospital; he had a series of epileptic fits which had commenced that day. Immediately after his admission he had a fit in which the following phenomena were noticed:—The left hand and arm began to twitch, the arm becoming flexed to a right angle at the elbow, the twitching then spread to the face, both legs, and right arm; all the muscles of the left side contracted more violently than those of the right, the face muscles very much so, and the left side came to rest first as the fit passed off; the eyes were turned up and to the left, the right pupil was somewhat dilated; head was

thrown back and turned to the left, the muscles of the neck were very rigid. The clonic spasms lasted about one minute, and as they passed off the patient immediately recovered consciousness and sweated profusely, with conjugate deviation of the eyes to the right; there remained loss of power and sensation very marked in the left arm, and to a less degree in the face and leg; he was unable to move his eyes to the left. During the first 48 hours in hospital he had 46 fits, all of which commenced in the left arm and ran a course similar to the one described.

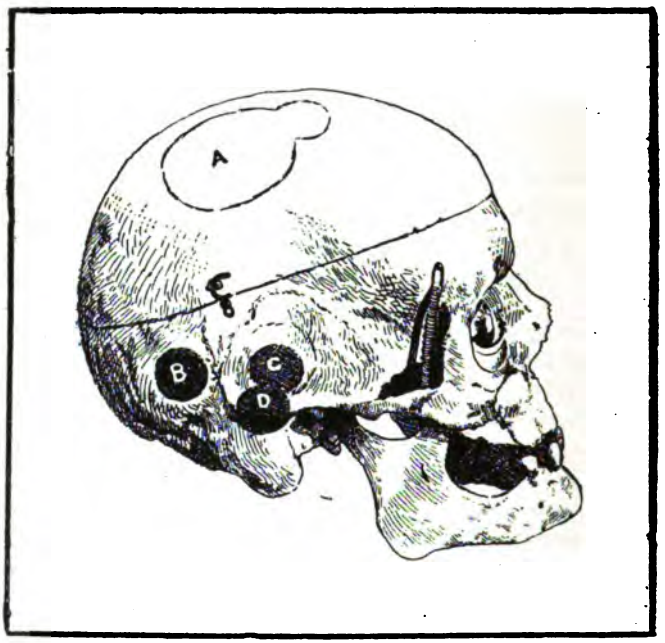

Figure illustrating Dr. Ball's Paper, drawn to scale.

A—Position in which trephine was applied in Case I.

B—Situation recommended by Mr. Barker for trephining in case of temporo-sphenoidal abscess.

C—Position selected in Case II.

D—Situation recommended by Mr. Wheeler.

The small dark circle below D marks the place recommended by Prof. Birmingham for opening the mastoid antrum.

A more typical picture of Jacksonian epilepsy due to cortical lesion it is hard to imagine, and as the spasms invariably com-

menced in the left hand and arm, it was determined to explore the right central motor area, notwithstanding the fact that the scalp wound was considerably behind and below this region. As it was not clear which of the arm centres was most involved, a two-inch trephine was applied to the middle of the Rolandic area, and the dura mater divided crucially in the opening thus made (A in figure). The brain was now carefully explored. At the upper and anterior portion of the circumference of the opening the dura was tightly adherent to the bone and subjacent brain, and in order to expose this thoroughly it was necessary to apply a three-quarter inch trephine. I found there for an area of about the size of a sixpence the grey substance of brain appeared altered into soft connective tissue, through which the subjacent white substance could be distinctly seen. The adhesions of the dura at this point were carefully separated, the flaps of membranes replaced and sutured with catgut, and the scalp replaced and sutured. The following day, January 2nd, the left arm was absolutely paralysed; he had also facial paralysis, slight strabismus, and dilatation of right pupil.

The recovery of motion in the arm was most interesting. On the third day he was able to move the shoulder muscles slightly; on the fifth he was able to move the arm at the elbow, but could not stir the fingers; by the 29th day he was able to flex the fingers fairly well, but could not stretch out the arm from the body; it was not for nearly a month subsequently that he was able to reach out his arm so as to pick up any object, and fully extend his fingers. The facial paralysis subsided a few days after operation. He convalesced well, the only drawback being that a buried catgut suture caused a few drops of suppuration, and was discharged after the wound had healed a month after operation. While the pus was forming he was a little dull and heavy, but he completely recovered after its evacuation. He has had no fit since the operation, but on the 8th March, 9 weeks after operation, the muscles of the left arm became rigid for a few minutes, followed by rigidity of the legs and right arm. There has been no recurrence of this symptom. He was discharged on the 5th of May, and was able to resume work as a fitter at the D. W. & W. Railway.

The lesion here was situated in the front of the ascending frontal convolution, and encroached on the posterior part of the superior frontal convolution to the centre, described by Ferrier as the pointing centre (No. 5), and the slow recovery of the power of extension

of the arm, compared with the other motions exhibited, is a striking instance of the accuracy with which the function has been localised in this region of the brain.

Case II.—B. R., female, aged seventeen years, admitted to Sir Patrick Dun's Hospital, August 9th, 1891. Six months previously she had received a blow on the right ear, followed by purulent discharge from the meatus, which has since continued.

On admission she lay in a listless, semi-comatose condition, but could be roused to take food and answer questions; she was very pallid; complained of great pain in her head, increased by percussion, also pain in back of neck, which was rigid, the head being retracted. There was slight internal strabismus stated to have been of long standing, pupils were regular and reacted to light, temp. 101°, pulse 92, slight purulent discharge from right ear, no œdema or marked tenderness over mastoid bone on that side.

She remained in the medical wards from August 9th to October 27th, during which time the following more important features of the case may be noted:—At times she was well enough to get *up* and go about, at others she lay in a semi-comatose condition, with relaxation of the sphincters, while again she had constipation and retention of urine. She vomited frequently; on two occasions she had a kind of fit, and became quite unconscious, the eyes staring, muscles rigid, followed by some irregular movements of right arm and leg—this condition lasted only a few minutes. On October 7th she was observed to have double optic neuritis—a condition which steadily increased, while the right pupil became markedly dilated. On October 26th she had a rigor, followed by a temperature of 101°. She was cyanosed, and complained of extreme pain in the head. It was consequently decided to trephine her at once, the diagnosis being made of abscess in the temporo-sphenoidal lobe, based mainly on the following grounds:—1st, long continued ear discharge; 2nd, gradually increasing stupor; 3rd, vomiting; 4th, double optic neuritis; 5th, dilatation of right pupil; 6th, rigor, fever, and great intra-cranial pain. The sense of smell was not tested.

I selected for the application of the trephine the place recommended by Mr. Hulke—directly above the external auditory meatus, and, profiting by Prof. Birmingham's valuable measurements on the mastoid region of the skull, took care that the lower portion of the trephine circumference was half an inch above the roof of the

external auditory meatus (C in figure). Upon removing the circle of bone the large posterior branch of the mid-meningeal artery was exposed crossing the centre of the opening; this was caught between two catch forceps, and the dura-mater divided across the whole circle exposed. The brain, much engorged with blood, bulged into the wound; the under border of the temporo-sphenoidal lobe being exposed, it was easy with a flat spatula to raise the brain from the petrous bone, absence of adhesions demonstrating that there was no direct continuity between the ear disease and the brain. A sterilised exploring needle was now thrust into the brain. At a distance of about a quarter of an inch an abscess cavity was opened, and the opening subsequently enlarged by separating the blades of a sinus forceps; a considerable quantity of pus, at least 1 fl. oz., escaped, and a drainage tube passed into the cavity, which was quite two inches across. The subsequent progress of the case was most satisfactory. On the 8th day, the discharge being only serous, the drainage tube was removed, and the sinus allowed to heal. Three weeks subsequently she became dull with increase of temperature and pain; the scar becoming prominent, the cicatrix was incised, and exit given to a small accumulation of pus. After this she gradually improved, became bright and cheerful, the optic neuritis disappeared, and she was discharged quite well, Feb. 8, 1892. Since that date she continued well; she has grown quite robust; a slight otorrhœa continuing for about six months after the operation, but is now completely stopped.

The best position for applying the trephine in cases of cerebral complications following otorrhœa, although much discussed, can scarcely be said to be as yet definitely settled. To this desirable end the papers of Prof. Birmingham on the mastoid region of the skull form a most important contribution. In them are to be found what the surgeon really wants—the limits of variability of important structures, and not the average position. From these it will be seen that the lateral sinus is subject to great variability, and that if the trephine is applied in the position selected by Mr. Wheeler (D in figure)—*i.e.*, the circumference of the trephine on a level with upper border of the external auditory meatus, and in front of a vertical line passing through

the tip of the mastoid process, the lateral sinus will be exposed in a considerable proportion of cases. In addition to risk of hæmorrhage, the field of operation is much limited by this procedure. Again, on mechanical grounds, as Prof. Birmingham has shown, this operation is objectionable; while one portion of the trephine circumference is cutting the thin squamous portion of the temporal bone, the lower portion is cutting deeply into the petrous bone. Undoubtedly, with care the remaining piece of bone can be broken through to remove the crown, but it is manifestly advantageous to select, if possible, a region for trephining where the skull is of more uniform thickness. There is, however, I think, a much graver objection to the adoption of Mr. Wheeler's site than either of the anatomical points above alluded to—that is, that where otorrhœa has existed for some time the air cells of the mastoid and so-called mastoid antrum are in a highly septic condition. If now one portion of the trephine crown is cutting through this highly septic focus, while the other is opening up the cranial cavity, it is impossible to conceive a more probable way of producing intra-cranial sepsis. With regard to the position selected by Mr. Barker (B in figure), Reid's base line must first be marked out—*i.e.*, a line joining the lower margin of the orbit with the middle of external auditory meatus, and produced backwards; the point at which the pin of the trephine must be applied is one and a half inches behind the centre of the external auditory meatus, and one and a half inches above this line. As Prof. Birmingham has pointed out, a three-quarter inch trephine applied here will sometimes expose the lateral sinus, and he suggests that to avoid this important structure the point selected should be two inches above Reid's line. In my opinion, Barker's point is too far removed from the focus of disease, while the additional half inch necessary to certainly avoid the sinus removes the site

of operation still further from the disease. I was present at an operation in which a three-quarter inch trephine, applied at Mr. Barker's point, exposed the lateral sinus, and failed in reaching an abscess which would readily have been dealt with had the opening been made immediately above the meatus. It appears to me that in the majority of cases of otorrhœa requiring surgical aid it will be possible so far to diagnosticate the state that one of four operations should be selected:—1. When disease is confined to the mastoid bone the antrum should be opened on the lines laid down by Professor Birmingham (small circle below .D in figure), and the cranial cavity not encroached upon at all. 2. Where abscess of the temporo-sphenoidal lobe is indicated, trephine immediately above the external auditory meatus, so that the lowest point of the trephine circumference is half an inch above the upper margin of the external auditory meatus. 3. Where the symptoms point to abscess of the cerebellum, as Professor Birmingham has pointed out, a three-quarter inch trephine applied one inch below Reid's base line, and two inches behind the centre of the meatus, will expose the cerebellum below the lateral sinus. 4. Where thrombosis of the lateral sinus is diagnosticated, cutting across the internal jugular vein and scraping out the septic clots, as recommended by Mr. Ballance, appears to be the most scientific procedure.

The Chairman said that the Section was to be congratulated on having listened to two such interesting papers there that night. One point of practical importance to him was the question of using this exceptionally large trephine. A case occurred in his own practice 16 years ago, and he felt quite confident that had he an instrument of that kind the patient's life would have been saved. It was the case of a young harvestman who received a violent blow on the head which stunned him. He recovered from this, but suffered from very severe headache afterwards. He diagnos-

ticated abscess, and used a ¾-inch trephine on the side of the head over the left orbit, but without coming down on any matter. The *post mortem* showed that if the trephine had been applied a quarter inch behind they would have come down upon a tolerably large abscess. He thought opening the skull in cases of otorrhœa and caries very important and he felt sure that they would ultimately be the accepted views.

Mr. M'Ardle said he could think of nothing worse than trephining over the mastoid. He agreed with Dr. Ball that they should go well above the external auditory meatus, because they were then absolutely out of harm's way. He also believed that in a great many cases of fracture extending through the lateral sinus death was due to detachment of the clot and its being carried to the heart. And in the future, where clotting is diagnosticated, he would be inclined to cut down and ligature the jugular vein. He noted that the return of power is always slowest in the extensor muscles of the arm.

Dr. Franks endorsed everything that Dr. Ball said about the position for trephining in otorrhœa—half an inch above the external auditory meatus is the rational place. He mentioned the case of a patient in the Adelaide Hospital who suffered from epileptic attacks, the result of a fall. He was treated for 12 months in the medical ward and put principally on bromides, which had no effect. The attacks were not localised. He picked out what was the most likely place to find mischief over a depression in the skull and found an old blood cyst. He cleaned this out, and for over a month the patient had no attacks. They then began again, but this time the bromides completely cured him. He would like to know whether the man operated on by Dr. Ball was of a bellicose disposition before he was trephined. Because, in the case of a workman in America whose frontal lobe was pierced right through with a crowbar, the man's disposition was completely changed for the worse afterwards. It seems as if injury to the frontal bone has this effect, because, in Dr. Ball's case, the tumour was likewise on the frontal lobe.

Dr. Ball, in reply, said he omitted to state that Dr. Parsons had made some very nice drawings showing the gradual subsidence of the optic neuritis in one of the cases. His reason for using Horsley's trephine was that localising symptoms were obscured by the paroxysms, and they could only go so far as to say that these originated in some of the arm centres, and in

order to expose as much as possible he used the large trephine. When they exposed the dura mater it was perfectly healthy, and it was only by sweeping the finger round that they found the disease at the margin of the trephine opening. With regard to the paralysis of the arm he admitted Mr. M'Ardle's contention in a general way. But the contrast between the good power of the flexors and the absolute incapacity of the extensors was so very marked that he thought they were justified in concluding that the observation of Ferrier was correct—that was, that when that portion of the brain is stimulated in monkeys, the finger is pointed out.

SECTION OF OBSTETRICS.

ARREST OF DEVELOPMENT IN INTRA-UTERINE LIFE.

By J. S. M'ARDLE, F.R.C.S.;
Surgeon, St. Vincent's Hospital.

[Read in the Section of Obstetrics, November 25, 1892.]

THE case which I desire to bring under your notice is one which excited considerable interest in legal circles during the trials of actions arising out of the terrible railway disaster which occurred near Armagh on the 12th of June, 1889. On that day a Mrs. Walker happened to travel *in* the ill-fated train, and while in the act of rising she was thrown violently on her back against the hard seat of the carriage, sustaining very extensive contusions over the lower dorsal, lumbar, and sacral regions. She was conveyed home, where she was confined to bed for a considerable time, suffering from deep-seated lumbar pains, tenderness along spine, stiffness of the legs, and vesical trouble. From all of these she recovered in time, with exception of the spinal tenderness, which caused her anxiety. On the 1st of December (five months and eighteen days after the accident) she gave birth to a child a little before the full term of gestation had been reached. This child—the claimant in the now well-known Walker case—forms the basis of this communication.

Born on the 1st of December, I had not an opportunity of examining it until the 10th of February, when I found it of average size, and apparently in good health.

Head.—On examining the head I found that ossification

was very incomplete, the only bones which showed solidity corresponding to the age being the temporals, supra-orbital parts of frontal and basilar portion of occipital. The remainder of the brain was covered by membrane, and that of very thin character. The deficiency measured 8¼ inches antero-posteriorly; at coronal suture, 4½; at sagittal, 3½—the appearance being that represented by Fig. 1.

There was no protrusion of brain, and the tension was very slight.

Spine.—For the upper two inches the spinal canal was complete. The lower cervical and upper dorsal region was marked by a fluctuating area 4 inches long and 3 inches wide. The lower dorsal, lumbar, and sacral showed a similar condition, the measurement of the defective parts being here 7 inches long by 4 inches wide. The condition is fairly well shown in Fig. 2.

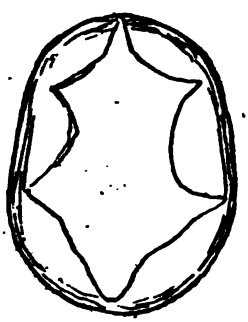

Fig. 1.

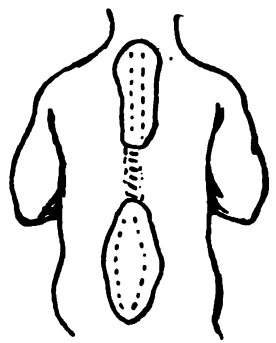

Fig. 2.

On deep examination I found that the vertebræ in both these regions were devoid of spinous processes, and the rudimentary laminæ could be felt distinctly, the transverse measurement between them being considerable, as shown by dots in Fig. 2. The stage of development of the neural

arches reached between the third and fourth month is roughly shown by Fig. 3. This stage was reached about the time the accident occurred to the mother of this child, and no further progress in development was made until I examined the child nearly three months after birth.

Indeed, I believe no improvement occurred until death robbed the lawyers of the most interesting case which had engaged their attention during many years.

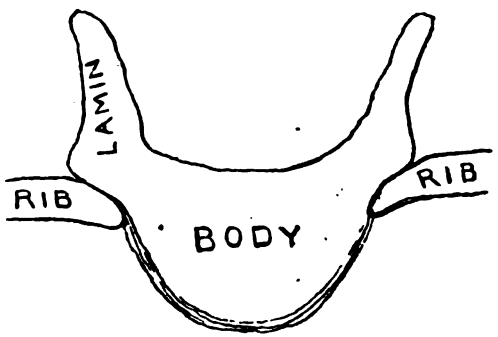

Fig. 3.

Limbs.—The arms were normal, but the right leg showed a curious arrest of development. While the lower part extending to the knee was of fair size when compared with the opposite limb, the femoral portion was so short that one would be inclined to expect a dislocation of the hip. On examination, however, the joint proved to be in a fœtal condition. Motion was perfectly free in every direction, showing that congenital dislocation was not present. The neck of the femur was short, the great trochanter small, and the femur measured two inches less than that of the opposite side.

The appearance of this defect is roughly shown in Fig. 4, where it may be seen that from above the knee downwards the limb is normal.

Taking now for consideration the condition of the skull, we find, as shown in Fig. 1, that although the basilar and lower frontal and temporal regions were fully developed, the upper frontal, parietal, and part of the occipital portion of the calvarium were just in the same position as regards development as they would be normally at the end of the third month. This is especially true about the parietals, which were in a most rudimentary state. Now, the ossific centre for these bones appears about the third month and progresses more quickly than in the basilar portion of the skull, and yet here was a case in which all signs of ossification were absent from the upper part of these structures, showing that growth had been arrested here about the time of the injury.

Passing now to a consideration of the spinal lesions described, let me call your attention to the drawing (Fig. 2) which I took from the case related. You will find that in the upper dorsal region the spinal arches have coalesced, while at the junction of the cervical and dorsal and in the entire lumbar areas the neural arch is incomplete. The neural laminæ project directly backwards, showing no tendency to inward growth. Compare this condition observed in the living child with a picture drawn by Humphreys, and here reproduced, of a fœtus at or about the third month, and you will have conclusive proof that the arrest of development here as in the skull occurred at the time of the injury to the mother. You see that the closure of the neural arches is complete in the dorsal region, the spine being represented by dotted lines, while a double row of dots marks the points where the laminæ stand out, showing no inclination to join. In the accompanying figure, taken from Humphreys' work on the human skeleton, you have a dorsal view of a fœtus of three months, showing that at that time coalescence of the neural arches in the dorsal region has taken place,

where, as he points out, "in the cervical, lumbar, and sacral regions there is a considerable interspace between them." The last vertebra in which these arches meet is the upper sacral, and hence the frequency of spina bifida here—that is, arrest of development may occur during a much longer interval in the upper sacral than in any other region; and I now exhibit a case in which, although the spinal canal was apparently perfectly closed, yet long after birth the membranous covering of the cord yielded and a spina bifida resulted.

Fig. 4.

Fig 5

Fig. 4 roughly represents the difference in the lower extremities. It will be seen that the leg is the same on both sides, but the right thigh is shortened, the arrest of development being confined to the neighbourhood of the hip-joint, which retained the fœtal state which one would expect to find about the third month.

I have briefly described the appearances noticed in February, 1890, and bring the notes of the case before this Section with the hope that I may elicit your opinions as to

the correctness or otherwise of the views I hold in regard to this want of proper development in this subject.

The opinion I expressed at the time of the trial was "that the injury to the mother, which necessitated her confinement to bed, lowered her vitality, and thus a lessening of the nutrition (taking place just at the time the neural arches should be closing) is accountable for the imperfection described."

As to the effect of mental emotions in the productions of deformities I can say little. The only birth-mark I saw in all the cases I examined was in the child of a Mrs. Murphy, who was in the early stage of pregnancy (seven weeks) at the time. The lady sustained a severe lacerated wound on the left hand, and in the left hand of the child there were and are subcutaneous streaks corresponding to the parts injured in the mother. On the left side the mother has still evidences of very extensive bruising, and over this area on the child there is a large purple nævus, with here and there brown mottling. It is possible that constant direction of the mother's mind to special parts of her own body, and of how her marks would influence the growth of her baby, may in some way interfere with nutrition. In Mrs. Walker's case she was constantly worrying about her own spine, and wondering if it would injure her child.

Whether the arrest of development I have so briefly brought before you arose in part from this mental anxiety, I leave you, the members of this Section, to be the judges.

Dr. M'Cullagh said the case of spinal bifida he had shown was ascribed by the mother to a blow on the back between the third and fourth months of pregnancy. On examination at the time he could see a distinct swelling over the dorsal region. The laminæ of the vertebræ were only in a rudimentary condition.

Dr. Smith said the whole case really rested upon the point of

maternal impressions. Cases of ordinary deformities and arrested developments are commonly known as amniotic adhesions. But here they had this interesting fact; they had a distinct accident occurring at a distinct period. There was no abortion and no miscarriage, and the woman went on to her full term. The child was born of apparently normal length and weight, but with a well-marked deformity that is referred to that part of the child where the mother received the injury, *i.e.*, in the back. The question then arises as to the maternal impressions, and he believed that nervous impressions sometimes produced these strange deformities.

Dr. Smyly did not believe in it at all. Mr. M'Ardle brought forward an ingenious theory; but the case was probably a remarkable coincidence, and nothing more. The degree of nutrition does not influence the fœtus. For instance, women are seen in the last stage of consumption bringing forth fairly well-nourished children. His experience was, that if you give the woman twelve hours to consider she will account for any deformity.

Dr. Broomfield said there were other organs that were equally tender in this stage of fœtal life, and he failed to see why disease should concentrate itself altogether on the laminæ of the vertebræ. The fœtus was well developed, except in the laminæ and in the bones of the cranium. Mr M'Ardle would therefore have to fall back upon the theory of impressions. But as the uterus influenced the whole structure, why should not the other structures suffer as well as the vertebræ? The coincidence was certainly very curious, but he thought that the doctrine of mal-nutrition would scarcely bear it out.

Mr. M'Ardle said the object he had in bringing the case forward was to elicit the opinions of his *confrères* on the subject. Dr. M'Cullagh's case of spinal bifida shows the truth of Dr. Humphrey's remark, that the vertebræ are the last closed. He simply queried the point regarding the maternal impression. Special injury to a nerve centre might interfere with certain nerve fibres, and it was absolutely certain that nervous influence must act upon the developing fœtus. And as in case of injury to the spinal cord, only one toe of the limb was found to slough; so in like manner, the mal-nutrition of the fœtus was regulated also. Therefore he did not see why the cause of local mal-nutrition could not be explained in the one case as well as in the other.

REPORT ON THE ABDOMINAL SECTIONS PERFORMED IN THE GYNÆCOLOGICAL WARDS OF ST. VINCENT'S HOSPITAL, DUBLIN.

By ALFRED J. SMITH,

Ex-Assistant Master, Rotunda Hospital; Examiner in Midwifery, Royal University; Professor of Midwifery, C.U.I.

[Read in the Section of Obstetrics, December 23, 1892.]

I HAVE the honour of bringing under notice a Report on the abdominal sections performed by me in the gynæcological wards of St. Vincent's Hospital since my appointment as gynæcologist.

The Report in reality represents the work of six months, as I was prevented by an attack of illness, and subsequently by the usual summer vacation, during which the wards are closed, from devoting any longer time to the work of this department.

Abdominal sections were performed twice for the removal of large unilocular ovarian tumours, twice for the removal of dermoid cysts, once to remove a multilocular ovarian tumour, once to remove a parovarian cyst, and once for the removal of hydrops follicularis of the right ovary—making in all seven cases with complete recovery.

I performed abdominal sections during the six months in seven cases as follows :—

Table of Abdominal Sections.

No.	Sent by	Name	Age	Married or unmarried	Date of operation	Nature of tumour	Peritoneum		Remarks	Stitches removed	Union	Result
							Flushed	Drained				
1	—	A. A.	46	M.	April 6, 1891	Unilocular ovarian tumour	Flushed	Not	Several fresh adhesions easily separated	April 14	Good	Recovery
2	—	M. M'D.	50	M.	May 19, 1891	Unilocular ovarian tumour	Not	Not	No complications	May 27	Good	Recovery
3	Dr. Garry, Liverpool	S. B.	22	Unmarried	Oct. 21, 1891	Dermoid cyst in right broad ligament	Flushed	Drained	Cyst was gaseous; was adherent to middle 3rd of the rectum; it burst during removal.	Some on Oct. 29th, 1891	Good	Recovery
4	—	M. G.,	24	M.	Oct. 11, 1892	Hydrops follicularis of right ovary	Not	Not	No complications	Oct. 19	Good	Recovery
5	Dr. Kelly, Eyrecourt, Galway	N. C.	39	M.	Nov. 2, 1892	Large dermoid cyst showing teeth	Not	Drained	No adhesion; contents of cyst spilled into abdomen	Nov. 10	Good	Recovery
6	—	M. R.	20	Unmarried	Nov. 4, 1892	Multilocular ovarian tumour, size of 8th month pregnant uterus	Flushed	Drained	Both parietal and visceral layers of the peritoneum covered with villous growth. Contents spilled, and soiled peritoneum	Nov. 12	Good	Recovery
7	Dr. Cox, Dublin	T. S.	45	M.	Nov. 16, 1892	Parovarian cyst	Not	Not	Pedicle very long	Nov. 24	Good	Recovery

In no case did the temperature reach 100° F.; in two instances—Cases No. 5 and No. 6—did the temperature reach 99·6° F. All the patients were able to be up on the 15th day after the operation except No. 3, who was not allowed up for six weeks. Most of the tumours have been already shown at this Section of the Academy, and the special points of interest were touched on; however, I hope I may be permitted to notice other points of interest in these cases now presented.

Case No. 2 developed a small hernia in the abdominal incision (3 in.), about the track of the second suture from the top. It is the size of a walnut, and first appeared about six weeks after the patient's return to the country. I ordered an abdominal belt; the hernia has not increased in size at the time of writing, and the belt causes no discomfort; however, I have invited the patient to undergo an operation for its radical cure.

No. 3 presents many points of interest. The patient, a young girl, aged twenty-two, had enjoyed good health up to twelve months before admission, when one day, while lifting a gallon of water from a well, she was suddenly seized by pain in the lower part of the abdomen of so intense a character that it was necessary to carry her to bed, in a fainting condition. Inflammatory symptoms set in, accompanied by rigors and rise of temperature—the patient's condition was for a time critical; however, a discharge of pus by the rectum gave considerable relief, and it was hoped the case would clear up. At every motion of the bowels pus would come away. This continued up to three months before admission, when the discharge suddenly ceased, and with this cessation hectic symptoms of a marked character set in, and the patient's condition became pitiable. On admission she presented all the symptoms of chronic septic poisoning, even to the well-marked chloasma marks on the forehead and nose,

the evening temperature reaching 103·5° F. On examination under ether the uterus was felt pushed over to the left side of the pelvis and was tolerably movable, and an ill-defined elastic mass was felt to its right side of so indefinite a character that I had at first considerable difficulty in making a diagnosis; I thought it might be some curious intestinal displacement. This elastic mass, when pushed up out of the pelvis, gave a clear note on percussion; this added to my confusion; still I was positive as to the presence of a tumour, because the impulse of the outside hand was conveyed to the inside fingers, and *vice versâ*.

I determined to explore, kindly assisted by Mr. M'Ardle. On opening the abdomen a tumour presented itself, which was tympanitic on percussion. Having satisfied myself that it was not an intestine but a tumour in the right broad ligament, I tore with my finger nail through the layer of broad ligament until I came to the wall of the tumour; the tumour shelled with great ease out of its bed, except for a slight adhesion to the middle third of the rectum; no pedicle was found. While enucleating an escape of fœtid gas from the tumour took place. I thought I opened into the rectum, but after the most careful search could find no fistula; as a precautionary measure I thoroughly disinfected the cavity in the broad ligament by swabbing it with cotton wadding soaked in weak corrosive sublimate solution, 1 in 5,000. I stitched the anterior layer of the broad ligament to the abdominal wall so as to cut off the peritoneum from the danger of infection, then flushed with hot water, put in a Keith's drainage-tube, and packed with iodoform gauze. I saw the case in a few hours; the dressing was soaked to a considerable extent with a watery discharge. I left the drainage-tube in all night, and next morning I was astonished to find the entire dressing soaked with a strong-smelling fæcal discharge, and I recognised that a fæcal fistula had formed.

I will not go into the details of the many dressings, the constant irrigations, the change of the glass drainage-tube for one of rubber, and still no improvement; the odour was so offensive from constant eructation of gas that it was obviously retarding the patient's recovery. I determined on draining and irrigating the patient's rectum. With this end I forcibly dilated the rectum, introduced a glass drainage-tube, which was kept in position, and thus the rectum could be constantly irrigated. The immediate result was most gratifying, the offensive smell almost disappeared, and the discharge through the fistula became greatly diminished and gradually less and less, until it finally disappeared. The patient was dismissed December 22nd, 1891, a little over two months after the operation, with a small sinus; this has now completely healed up. This case, I think, shows that fistula of the middle portion of the rectum will close by granulation, and that the secret of success is the proper management of the bowels. Keep the rectum well drained, free from gas, and well irrigated.

In Case No. 4 I operated by elevating the pelvis on Trendelenburg's table. The patient complained of great pelvic pain the evening after the operation; it continued all night, the patient calling out for its relief. One-third gr. morphin was given hypodermically with only temporary benefit, as the pains returned directly the morphin had lost its effect; the temperature and pulse remained normal. A discharge of blood from the uterus ensued, and then the pains disappeared; the discharge continued for two days, six napkins being required. Against this hæmorrhage I employed no treatment, as I considered it to be due to the sudden change of pressure in the blood-vessels of the uterus, brought about by the operation.

Case No. 6 was remarkable for the alarming high rate of the pulse—120 per minute; this rate was maintained all

during the convalescence; and when the temperature rose on the third day to 99·6° F. I felt anxious. The quiet, contented expression of the patient, however, reassured me, and I was glad to have an opportunity of verifying the dictum of Mr. Lawson Tait, that the expression of the face is often of more importance in prognosis than either the temperature or the pulse.

Flushing the peritoneum with large quantities of hot water was employed in only three cases; it was not necessary in Cases No. 2, No. 4, and No. 7, as the peritoneum was not damaged or soiled in any way. I would have considered its employment meddlesome and unnecessary. In Case No. 5, although the peritoneum was slightly soiled by the spilling of the contents of the dermoid cyst, I did not flush, as my experience hitherto was that hot water seemed to have little or no effect in dislodging the greasy sebaceous material found in dermoid cysts. I cleansed as well as I could with cotton wadding moistened in a corrosive sublimate solution, 1 in 5,000. As a rule, I avoid sponging, the excess of fluid after flushing being removed by aspiration.

Drainage by Keith's glass tube was employed in Cases 3, 5, and 6. A strip of iodoform gauze was passed down the lumen of the tube to assist in draining by capillary attraction. In all cases where the drainage-tube was used I placed the patient in the permanent side position, the old position on the back being, to my mind, opposed to gravitation. The side position I found most satisfactory, as nothing could be aspirated from the drainage-tube when the dressing was changed—all discharge had come away. To prevent granulation growing into the perforations at the end of the tube, I simply rotated the tube through half a circle each time the case was dressed.

In Case No. 6 it was necessary to keep the drainage-tube in for three days, as the discharge was so free. This free

discharge ceased after the bowels moved. I close the abdominal incisions by interrupted silk sutures, the peritoneum being included in each suture. The dressing employed is very simple—a powder of equal parts of iodoform and boric acid is dusted over the wound, over this a small strip of oil silk, then a layer of absorbent cotton, with protective and gauze, all held in position by strips of rubber plaster, and over all a flannel binder.

The after-treatment consists of giving hot water in teaspoonful doses as often as the patient requires it for the first 48 hours, then milk and weak tea. I avoid giving morphin unless absolutely necessary. For flatulence I find that twenty drops of spirit of cajuput with twenty drops of aromatic spirit of ammonia in a little water is safe and efficient. Purgatives are given the third morning after operation. I generally order 5 grs. of calomel, but in one case in which I ordered mist. rosæ (the saline mixture of the hospital) in a one ounce dose, I was greatly satisfied with its quick action. When the bowels did not act I gave a turpentine enema. In Case No. 3, where the bowel was damaged, a purgative was not given until the 8th day. Except where drainage was employed, the dressing was not removed until the 8th day. Before removing the stitches I took the precaution of saturating their free ends with corrosive sublimate solution, 1 in 1,000. I had no irritation in the suture track in any one case. All incisions seemed to heal by first intention.

Antiseptics.—I superintended every detail myself, assisted by the sister in charge of the ward. The silk is boiled for half an hour in ordinary Vartry water; it is then placed on glass spools and kept in a bath of corrosive sublimate solution, 1 in 1,000, until required for use. The blunt instruments are also boiled in Vartry water for one hour. I have given up the ordinary dry steriliser, as I considered it untrustworthy from the fact that bacteria and their spores,

if exposed only to the influence of a dry heat, may lose their powers of development only in part. The cutting instruments are disinfected by absolute alcohol. No doubt boiling your instruments spoils them, but I prefer, for my part, the loss of my instruments to the loss of my patient.

The stages for rendering the hands aseptic are—1st. Trimming the finger nails. 2nd. Scrubbing for 3 minutes with a nail brush in a lather of carbolic soap and hot water. 3rd. Rinsing in carbolic solution, 1 in 100. 4th. Bathing in corrosive sublimate solution, 1 in 500, for one minute. If it be necessary to dry the hands, a dry corrosive sublimate towel is used.

The patient receives a hot soap and water bath the night before the operation. Immediately before operating, the abdomen is washed with ether and then sponged with a hot corrosive sublimate solution. All instruments are kept in hot carbolic solution, 1 in 100. The sponges used during the operation are thoroughly disinfected by soaking them in a weak solution of sulphurous acid and then are repeatedly washed in carbolic acid solution, 1 in 100. Dry corrosive sublimate towels are spread over the chest and thighs of the patient as a further protection against the danger of infection. The anæsthetic used is ether, and I must here acknowledge the thoroughly satisfactory way in which Dr. Marnell, House Physician, administered it.

It is to me a source of some regret that I have not a larger number of completed cases to bring forward, as from so small a number, even though uniformly successful, it is impossible to draw any conclusion or deduce any theory.

Dr. Atthill hoped that this paper would give rise to some discussion, as there were several points of interest connected with it. He thought that the disinfection of the instruments in boiling water was one of the safest and best methods. He certainly had

not ceased to believe in antiseptics. He thought the use of the calomel purge a very wholesome practice. When given in from 3 to 5 grains it acts with the greatest satisfaction.

Dr. Smyly said the points of especial interest to him were the occurrence of hernia, the cleansing of the peritoneum, the dressing with boracic powder, and the boiling of the instruments. He (Dr. Smyly) came to the conclusion that hernia was the result of suppuration. He did not begrudge the time expended in stitching the different layers if this prevented the hernia. He next referred to a case of dermoid tumour which, on tapping, unfortunately burst through the posterior part, and the matter escaped into the abdomen. He sponged it out as cleanly as he could, but he regretted that he did not use hot water, as the patient rapidly went to the bad. He thought that the dermoid matter would probably float on the top of the water. He thought drainage on the side a mistake, as the tube does not go to the most dependent places, and the fluid was down in the groin. The powder also seemed to him to be a mistake, because it keeps the surfaces from coming into apposition, and prevents union of the superficial parts of the skin, whereas if you make it perfectly dry it will heal by the first intention. With regard to the disinfection of the instruments, the method he adopts is to sterilise them at a heat of 300°, and before using them they boil them for half an hour in a soda solution, which does not spoil them.

Dr. Parsons asked as to the explanation of the pain in rectal fistula, as it presented all the signs of perforation. He asked if steaming had been applied to the disinfection of the instruments, as bacteriologists have found it the most effective in destroying the spores of the anthrax bacillus.

Dr. Atthill wished to know how the steam was superior to boiling water.

Dr. Parsons said it was practically shown in the case of anthrax bacillus. Feathers infected with anthrax bacillus were immersed in boiling water and others were steamed. When these were introduced into animals it was found that the animals contracted the anthrax when the feathers were boiled, whereas the animals escaped when the feathers were steamed.

Dr. Glenn desired to know whether, when the glass tube was retained for three days, there was any difficulty experienced in stitching the wound.

The President said a solution of 1 in 500 of the perchloride of

mercury was quite sufficient to guard against any septic matter. He then referred to some experiments made by Sir Charles Cameron on vaccine lymph, obtained from the Local Government Board. He used sulphurous acid, and the result was that a high percentage of sulphurous acid destroyed the action of the lymph, but that a low percentage had no effect. They could therefore expose their instruments to a very easy method of disinfection by means of sulphurous acid.

Dr. A. J. Smith, in reply to Dr. Atthill, said he looked upon the carbolic solution as the best antiseptic he had at the time. Dr. Smyly found that the hernia was due to suppuration in the sutures, but in his cases there was perfect union, and when he found patients coming back to him with these little herniæ in the incisions, he (Dr. Smith) was quite astonished, especially as there was not even a trace of suppuration. He remembered a case where the contents of a dermoid cyst were spilled and the patient was douched, but she died. On turning up the intestines he found traces of the cysts even after washing out, and the result of washing was to put particles into quarters where one could not get at them. He cleansed them carefully with sponges, and left in a drainage-tube, and the result was most satisfactory. The patient always lies against a bolster at the side, and probably this might prevent the fluid coming down into the flank. He was more than glad to be informed of the efficacy of the soda solution for instruments. He thought steaming the latest fad and a very expensive one as well, and he never had any reason to regret the corrosive sublimate solution. In reply to Dr. Glenn, he said there was no difficulty whatever in union of the wounds.

NOTES ON A CASE OF SPINA BIFIDA.

By JOHN M'CULLAGH, L.R.C.S., F.L.R.C.P.;
Senior Surgeon, Children's Hospital, Temple-street.

[Read in the Obstetrical Section, February 3, 1892]

As the paper I purpose reading is actually a mere clinical record of the case of spina bifida exhibited at your last meeting (November 25), and the deformity in question lies so closely on the borderland between pure surgery and obstetrics, I have not the same hesitation about submitting it to this Section that I would have had, had I aimed at a more ambitious production.

With the literature of the subject you are at least as well acquainted as I am, the authorities are easily accessible, and to occupy your time with an elaborate essay (nine-tenths compilation, and the remainder a mixture of theory and observation) would be to submit to an unjustifiable trial your courtesy and patience.

J. A. M., aged five years and two months, is the son of a gardener. He is the seventh child of a family of eleven, of whom nine are living and two dead—the deaths resulting, one from scarlatina and one from convulsions. There has been one miscarriage, no obtainable history of syphilis, rachites, or tubercle; and, with the exception of one girl, aged eleven, in whom the phthisical diathesis is well marked, all the surviving children are healthy. The father suffers from an affection of the spine, the result of injury, but is otherwise sound, and the mother is a typically hale woman. The latter, rightly or wrongly, attributes the deformity from which my little patient suffered to a blow received during pregnancy.

The history of the case is as follows:—After recovery from her confinement, on taking over the child from the midwife, the mother, to use her own words, "found on his back *a little blue bladder the size of a shell.*" Cross-examination proved that this meant about the size of a chestnut. Nothing having been said to her on the matter until she discovered it herself, she thought little of it at the time; but its subsequent rapid increase alarming her she brought the child to me at the Children's Hospital, Temple-street, he being then just ten months old.

On examination I found in the lumbo-sacral region an ovoid tumour, four inches long, three broad, and varying from two and a half to three inches elevation from the surface, the long axis of the oval corresponding to the vertebral line. It was sessile, perfectly translucent, varying in colour from deep blue to grey, marked by white bands arranged in a whorl, and traversed here and there by a fine network of vessels. The white bands, distinctly fibrous in character, corresponded with the depressions on the surface of the tumour, as if they constricted it.

The contents were liquid, the aspirating needle withdrawing an albuminous fluid of low specific gravity; but though the tension of the sac did not seem materially influenced by either crying or position, the fontanelles normal, and the head not hydrocephalic, I saw no reason to doubt its sub-arachnoid nature.

The covering of the tumour down to its base consisted solely of the spinal meninges, no attempt at skin formation whatever existing, not even in the cicatricial form sometimes noticed, unless we take the before mentioned white fibrous bands as representing the latter; and the line of junction of the sac margin with the normal tissues was clearly defined. The posterior neural arches were absent, and represented by rudimentary diverging laminæ. There was no pedicle, the

cord or, more properly speaking, nerves protruding, but, strange to say, as far as I could ascertain, were neither spread out nor adherent to the covering. Actual paralysis there was none, as sensation and, to a certain extent at least, reflex motion were present; but there was marked atrophy.

Under the circumstances diagnosis was not difficult. The character of the deformity excluded the ordinary congenital sacral tumours, such as "included parasites," so-called; fibroids, caudal excrescences, and lipomata: and my task was reduced to ensuring that I was not dealing with a false spina bifida, or a congenital sacral cyst. As regards the latter, apart from the extreme rarity of such growths, the position of the tumour, the nature of its coverings, and its homogeneous character, almost precluded the possibility of error; whilst as to the former, I have already called attention to the fact that, in my case, the excrescence was sessile, whereas the essential characteristic of the false spina bifida is the pedunculated and occluded sac.

Having satisfied myself as to the nature of that with which I had to deal, I was not long in determining that the case was one calling for prompt operative interference.

Cases of spina bifida may be divided into those in which you *must not operate;* in which you *may operate;* and in which you *must operate;* and to the latter class I believed the one of which I am treating belonged, for the following reasons:—

In the first place, the absence of any even rudimentary attempts at skin-formation forbade all hope of the always problematic chance of spontaneous cure.

Secondly, the rapid growth, thin covering, and high tension, pointed to the early probability of sloughing, ulceration, rupture, and death.

Thirdly, the absence of pedicle precluded all idea of the weight of the tumour producing such elongation as might

result in the occlusion of the orifice of communication with the spinal canal; and so the conversion of the spina bifida into a comparatively innocuous cyst, which might afterwards be removed, if desirable.

Lastly, the condition of the child, healthy and well-formed above, daily growing more deformed and wasted below; doomed, if unrelieved, probably to an early and painful death, certainly to a life of suffering ever increasing, if he survived.

Having decided to operate, my next step was to choose the method, and in doing so, putting aside all thoughts of trying any of the older processes, whether the instantaneous strangulation of the older surgeons, the gradual strangulation of Benard, the clamping of Dubois, or the excision which is even still practised, and all of which have had practically fatal results, I determined to use the iodo-glycerine method best known in connection with the name of Dr. Morton, although I believe originally proposed and successfully tried by Dr. Brainard, of Chicago. There is a slight difference in the solutions (Dr. Brainard using 5 grains iodine, 15 grains iodide of potassium, and an ounce of water; Dr. Morton 10 grains iodine, 30 grains iodide of potassium, and an ounce of glycerine as the vehicle). The process, even to the preliminary withdrawal of the sub-arachnoid fluid, is the same, as also is the object, namely, the exciting such local inflammation in the sac as may lead to formative changes.

It will be seen, however, that in carrying out the treatment I somewhat modified it, and I think I shall be able to justify myself in having done so.

In the first place, in a spina bifida of any size, such as the one I had to deal with, I very much doubted whether the withdrawal of such a quantity of fluid as one or two drachms could have much effect in producing the result aimed at—namely, the lessening of tension; nevertheless, at the two

first sittings I religiously followed the instructions laid down for my guidance, but finding I could obtain flaccidity as well, if not better, by laying the child on its face with the hips slightly raised, I abandoned the aspirations, particularly as on the second occasion it was followed by a well-marked convulsion, post or propter I am not prepared to say.

Next, on closely observing the results of the injections, I found that, whilst at the points where the needle passed completely through the coverings, the effect was either *nil*, or the production of a slight circumscribed meningitis; wherever the penetration was not perfect, as at the margins and the white bands already mentioned, small patches closely resembling the islands formed in skin-grafting were produced. In consequence of this I confined myself altogether to dealing with the bands and the edges of the tumour, and the result more than fulfilled my anticipations. The skin rapidly advanced, not alone along the bands, but over the margins of the swelling, and the whole was soon covered in. I then ceased the injections altogether, but had the surface painted over with a double strength solution, the covering thickening, and soon assuming the indurated condition you may have seen in the child exhibited.

Careful examination will show, that not only is protection complete and adequate; but the hollow where the vertebral spines should be, but are not, can no longer be felt.

The mother's own account of the child is, that he has "a more stronger constitution than 'ere another," and I can answer for it that he is fully as intelligent and ill-conducted as any average boy of his age.

The sittings had to be suspended, once in consequence of measles, and once because of bronchitis.

I may add, that I myself believe the subsequent meningitis developed in many cases treated by the iodo-glycerine method is due to the intra-saccular injections; that neither

they nor the preliminary evacuations of the contained fluid are necessary; and, finally, that Dr. Morton's method, as modified, is not only incomparably safer, but gives a result as good as could be hoped for from the most successful plastic operation.

Dr. Atthill said the improvement in this case appeared to commence from the outside, and he inferred that external applications were good. He referred to the intractable nature of such cases and their usually fatal results.

Dr. Frazer wished to know what quantity of fluid was injected at a time, and whether he allowed it to remain in or be drawn off again. And next, where he would commence to inject, and how far the injection should be pushed into the sac.

Mr. M'Ardle referred to a case, which he himself had exhibited, of large spina bifida, which cured spontaneously, but only after a long and painful illness. He said that the treatment which Dr. M'Cullagh had so successfully carried out was certainly devoid of any element of danger. He took it that the injections were made between the outer covering of the sac and the lining membrane of the sac. His experience was, that children with large spina bifida die before reaching the age of 4. He wished to know the time occupied by this treatment and the number of injections, and the length of time that intervened between each injection. He thought that the reduction in the size of the tumours was due to the small opening in the spinal canal being closed up by exudation. He contended that the skin alone would not be sufficient to support the spina bifida, because when the child arrived at an age to make exertion, the tumour would re-appear. It was not the support of the skin, but the closing of the tiny opening, which is necessary, and where the opening was small he thought there was every hope of plastic exudation closing it up.

Dr. M'Cullagh, in reply to Dr. Frazer, said that he usually injected 40 minims at each injection. The only place where he obtained any practical result was at the margin of the sac and along the lines of the white fibrous bands, so that the needle did not enter the sac, but between the walls of the sac. He went on using the injections until two-thirds of the tumour were covered. In reply to Mr. M'Ardle, he said that treatment began on the day on which

he saw the child, because of the probable occurrence of perforation and ulceration. Ulceration always occurred in cases where there was no true skin, and the subsequent perforation always proved fatal. The covering of the tumour in the case on exhibition was now of the thick indurated type, resembling connective tissue. The opening of the canal in his case was not a small one, as it extended for nearly the length of two vertebræ and their intervening discs. The tumour was sessile and not pedunculated. He rested his diagnosis on the facts that the tumour was sessile, that the opening into the sac was large, and that there was no pedicle.

REPORT OF 112 ABDOMINAL SECTIONS PERFORMED IN THE ROTUNDA HOSPITAL.

By W. J. SMYLY, M.D., F.R.C.P.;
Master of the Rotunda Lying-in Hospital.

[Read in the Obstetrical Section, February 3, 1893.]

I HAVE found the greatest difficulty in tabulating my cases. For example, in one case I removed an ovarian tumour and a myoma at one operation; the patient died of pulmonary embolism; this would raise the mortality in both groups. In another, I removed an ovarian tumour and an extra-uterine fœtation—this would appear as two recoveries. I have, therefore, given a list of the diseases for which abdominal section was performed, and have stated the number of cases detailing the complications and results subsequently.

Ovariotomy for—		*Removal of Appendages for*—	
Fibroma	1	Salpingitis	6
Myoma	1	Pyosalpinx	12
Sarcoma	1	Tuberculosis	1
Carcinoma	1	Cancer	1
Cystoma proliferum glandulare	27	Bleeding myomata	4
Dermoids	11	Myomectomy	3
Parovarian cyst	1		
Hysterectomy for—		Intestinal anastomosis	1
Myoma	18	Intestinal obstruction	1
„ and cancer	2	Suppurating hæmatoma	1
Cancer	1	Nephrectomy	2
Porro's operation	1	Prolapsus ani	1
Cæsarean section	3	Umbilical hernia	1
Extra-uterine fœtation	3	Lumbar abscess	1
Cyst of broad ligament	1	Exploratory	6
Peritonitis	4		

There were forty-three ovariotomies with seven deaths. The fatal cases were as follow:—

CANCER OF THE OVARY.

Case I.—A young girl, aged nineteen. Her abdomen was distended with ascitic fluid, in which a solid and freely-movable tumour was detected. It was about as large as an adult head, and was connected with the right corner of the uterus by a long pedicle. The right side of the thorax was full of fluid, and was tapped on two occasions; but in order to relieve her respiratory troubles, it was necessary also to empty the abdomen. I, therefore, opened the latter cavity by a long incision, and drew out the tumour, ligatured, divided, and returned the pedicle. The tumour proved, on subsequent examination, to be a solid cancer, and the peritoneum was also extensively diseased. Having introduced the abdominal stitches, I was surprised, upon removing the sponge which I had introduced into the abdomen, to find it saturated with blood, and a quantity of the same fluid welling-up out of the pelvis. I at once drew up the pedicle, but found it secure. The only other possible source of hæmorrhage was a rent in the broad ligament, which, being extensively diseased, was unusually brittle. I tried in vain to remove the blood, either by sponging or hot-water flushing, with sufficient quickness to gain a view of the rent. I, therefore, transfixed the broad ligament as deeply as possible, and tied a ligature on each side of the base of the pedicle, but without effect. Finally, I tied the ligament close to the uterus, and thus controlled the hæmorrhage so that, by sponging, I could gain a view of a small crack on the posterior surface of the broad ligament, from which some blood was still oozing. This was checked by the application of perchloride of iron. The patient was by this time so collapsed that some of the bystanders thought that she was dead. The wound was, however, closed in the ordinary way, and the patient, whom I was afraid to remove from the operating table, was wrapped up in blankets, her legs elevated upon a chair, and restoratives actively employed. Four hours later she had so far recovered that she was removed to her bed. From that time she made an uninterrupted recovery, and was out of bed in a fortnight; but more than three weeks after the operation, and the day before she should have gone home, her mother brought her a present of some unripe apples, of which she ate six. That night she was attacked with violent colic, followed by complete

obstruction of the bowels. Unfortunately, owing to morphia having been administered without my knowledge, the diagnosis was so far obscured that I did not feel justified in reopening the abdomen until the third day after complete obstruction had occurred. I then found a coil of small intestine twisted round a band which extended from the place where perchloride of iron had been applied to another coil of the gut. The band was removed, and the gut set free. On the two following days she had copious fæcal evacuations; but she gradually sank, and died on the third day.

Case II. was an easy ovariotomy, but was complicated by a myomectomy. She died of pulmonary embolism on the third day. I shall again refer to this case.

Case III. had a large proliferous cyst, and was in the eighth month of pregnancy. She had been tapped three weeks previously in another hospital, where induction of premature labour was suggested, but refused. On admission to the Rotunda she was in a most deplorable condition, having been unable to lie down for days, owing to the upward pressure of the enormously distended abdomen. I performed ovariotomy without delay, the patient being in a reclining posture. The tumour was, owing to recent peritonitis, everywhere adherent to the abdominal walls, omentum, uterus and intestines. These adhesions were easily separated by sponge pressure, but bled profusely; and, though the hæmorrhage rapidly ceased, yet, owing to the enormous surface involved, the total loss was by no means inconsiderable. The tumour itself contained a large quantity of semi-digested blood. The patient died the same night of collapse, and I believe her death was due to the previous tapping and delay. The same observations apply to the next case.

Case IV.—This patient was tapped before sending her up from the country, her medical attendant believing, and, I have no doubt, correctly, that, owing to the great size of the tumour, she could not travel safely unless it were diminished. Upon opening the abdomen, I found it full of thick colloid matter, which not only coated and adhered firmly to the peritoneal covering of all the abdominal viscera, but appeared to be undergoing a process of organisation—a condition described by Werth as *pseudomyxoma peritonei*. Being afraid to trust so much material either to absorption or removal by the drainage tube, I spent two hours in cleansing the abdomen both

by sponging and flushing with hot water, but with only partial success. The patient died on the third day.

Case V. made an excellent recovery for three weeks, when her temperature began to rise in the evening, sometimes reaching 101° Fahr., and a tumour was detected in the right side of the pelvis, which, from the character of the fever which accompanied it, evidently contained pus. I, therefore, opened the abdomen again, passed the needle of an aspirator through the tumour in two different directions; but, obtaining no pus, I closed the abdomen again. Next day the abscess burst into the rectum; the fever assumed a more markedly hectic character, with sweating and diarrhœa, and she finally died, two months after the first operation.

I was for some time inclined to think that the abscess was due to cellulitis, probably connected with the pedicle. But Dr. Alfred Smith suggested to me that it was more probably a hæmatoma which had suppurated; and, considering the long afebrile period succeeding the operation, I think this view is correct.

Case VI.—The next case came into hospital with high fever, evidently connected with the condition of the tumour. The latter, which proved to be a dermoid, about as large as an adult head, was imbedded below in a mass of what at the time I took to be inflammatory exudation, but which subsequent microscopic examination proved to be cancer. In digging the tumour out of this mass I ruptured the cyst-wall, and the putrid contents were extravasated. The cancer bled so profusely that it was necessary to plug with iodoform gauze to check it. Her death was the only result that could have been expected.

Case VII.—This was a dermoid, about the same size as the former one. The operation presented no difficulties; but when I was thrusting the trocar into the tumour the posterior wall gave way, and the contents were extravasated; and though, after removal of the tumour, I cleansed the peritoneum as thoroughly as I could by sponging, yet she died of septicæmia on the sixth day.

Before leaving the subject of ovariotomy, I shall briefly allude to some of the more complicated of the cases

which recovered. In one I removed a small dermoid of the left ovary and enucleated a cyst, which, on subsequent examination by Dr. Earl, was reported to be an ovum, from between the layers of the right broad ligament.

In another case the pedicle was twisted four times upon its axis, and the tumour was universally adherent. Another had cancer of the peritoneum; and several coils of intestine were so intimately connected with the cyst wall that I was obliged to leave some portions of the latter behind, simply removing the mucous coat.

Another was an old woman, seventy-six years of age. The cyst had ruptured, and was generally adherent; but its walls were so macerated that it could only be removed piecemeal. The abdomen contained a greenish fluid, which was removed by flushing with hot water and sponging.

UTERINE APPENDAGES.

Of the six cases in which I removed the tubes and ovaries for salpingitis, with recurrent attacks of peritonitis, all recovered; in five, the operation was bilateral; in one, unilateral. In that case the right tube and ovary did not appear irrevocably damaged, and I therefore felt justified in leaving them behind, simply breaking down adhesions, so as to set them free. Two were complicated by retroversion of the uterus, with adhesion. Having broken down the adhesions, I stitched the fundus to the abdominal wall in front. In both the uterus was retained in this position. One of these patients became a wardmaid in the hospital, and was one of the best workers in the house.

There were twelve cases in which the appendages were removed for pyosalpinx. These were some of the most difficult operations that I performed—the adhesions being generally dense and unyielding, and the tube-walls and

intestines in their neighbourhood so soft and friable, that rupture with extravasation frequently occurred. This was the cause of death in the four fatal cases; and of those which recovered two had fæcal fistulæ, one of which healed spontaneously; but in the other there is still some discharge from a small hole at the lower end of the abdominal wound. In one case I found it impossible to remove the second tube, and she has not benefited much by the operation.

In four cases I removed the appendages for bleeding myoma. All recovered; but in one the bleeding continued as before.

I operated upon one case of cancer of the tube, supposing it to be an inflammatory condition. The operation was exceedingly difficult, and the rectum was opened in two places. These I closed by suture; but the patient died of collapse. The true nature of the case was revealed by the microscope.

MYOMATA.

There were three myomectomies, in which the tumour only was removed, and twenty hysterectomies, in which the uterus was also taken away. In fifteen of these I performed a supravaginal amputation of the uterus with extra-peritoneal fixation of the stump, and in five I extirpated the entire uterus. I have not tried the intra-peritoneal method of treating the pedicle.

Of the three myomectomies, two were for pedunculated tumours. In one the pedicle was long and thin, and was transfixed and tied as in ovariotomy. The patient, who was six months pregnant, made a good recovery, and the course of pregnancy was not interrupted. In the second, the pedicle was short and thick. An elastic ligature was placed around the uterus; and a wedge-shaped piece having been cut out of the pedicle, the cavity thus formed

was closed by suture, and covered with peritoneum; an ovarian tumour was removed at the same time. This patient, who has already been mentioned as a fatal case of ovariotomy, died of pulmonary embolism.

The third was a sessile tumour embedded in the wall of the uterus by about one-third of its bulk, and was about the size of an adult fist, partly calcified, and very heavy for its size. There was total prolapse of the uterus, which could not be relieved by any kind of pessary. I enucleated the tumour, which was situated near the fundus, on the anterior aspect of the uterus, and stitched the cavity left from the bottom. I also removed the ovaries, which were cystic, and fixed the uterus to the abdominal wall in front. The patient made a good, but somewhat protracted, recovery.

Of the fifteen cases in which I removed the uterus, and treated the stump extra-peritoneally, three died. In one the tumour was of enormous size, extending from near the ensiform cartilage to within an inch of the tuberosities of the ischia. The operation was tedious, and was extremely difficult, especially the enucleation of the pelvic portion, which was not covered by peritoneum; and I was unable to apply the elastic ligature to the cervix until it was practically completed. The patient died of sapræmia on the sixth day. On *post-mortem* examination the peritoneal cavity was found to contain about two pints of putrid fluid. I now believe that drainage per vaginam would have saved her life. The second case had been so reduced by previous hæmorrhage, that she came for operation in a very ex-sanguine condition, and never rallied from the shock. In the third the tumour had suppurated, and the patient had high fever before the operation. The lower portion of the tumour was firmly wedged into the pelvis, and was extra-peritoneal. Whilst enucleating this portion from the

cellular tissue, I unfortunately ruptured the wall of the abcess, and upwards of a pint of pus escaped, causing fatal peritonitis. Of the cases which recovered, one was a sloughing myoma, about as large as a six months' pregnancy, and the case was further complicated by a large sloughing polypus which filled the vagina and caused violent bearing-down efforts. This patient had previously had a large sloughing polypus removed by another operator, after which she had septic fever and diphtheria, followed by paralysis of the soft palate. On admission to the Rotunda she was in a very anæmic condition with hectic fever, her evening temperature reaching 104° F. I removed the polypus per vaginam, and two days later the uterus by abdominal section. My chief difficulty was the enucleation of the ovaries, which were as large as billiard-balls, and deeply embedded in inflammatory exudation; their pedicles were crossed behind the uterus so that the left ovary was on the right side, and the right one on the left side; their capsules were calcified and the interior filled with pus. Having drawn the uterus out of the abdominal cavity and applied the serre-nœud, I stitched the peritoneum around the stump, and closed the abdominal wound. Having carefully protected it with sponges, I finally removed the uterus, thoroughly cauterised the stump with the actual cautery, and dressed it with tannic and salicylic acid powder. She made an excellent recovery, but has since developed a ventral hernia.

In one case the tumour, which was about the size of a fœtal head, had developed behind the uterus, and, excepting its upper surface, was entirely extra-peritoneal. Having divided the peritoneum over it by a crucial incision, I enucleated the tumour and drained the cavity left per vaginam, closing the peritoneum over it by catgut suture. In another case I intended to perform total

extirpation, but found the rectum so firmly adherent to the cervix that I was obliged to abandon this method and fix the stump outside. The serre-nœud was applied about an inch above the place where the gut was attached, but the stump sloughed to a greater depth than I expected, and a fæcal fistula formed, which I was able to close by a subsequent operation.

In five cases I performed total extirpation of the uterus, freeing the cervix per vaginam, and subsequently removing the entire organ by abdominal section. One of these patients died. In two cases I adopted this method because of malignant disease of the mucous membrane—in one, malignant adenoma; in the other, carcinoma. Both these women are now alive and well—one, two years after the operation; the other, several months. In two other cases I adopted this method in order to save the patients the pain caused by the strangulation of the stump, and the tedious convalescence inseparable from the extra-peritoneal fixation of the stump. In one of them the uterus was not much larger than a fœtal head, but was infested by a number of myomata. I removed the appendages, but the hæmorrhages continuing, I dilated the uterus, and removed a small polypus; no improvement resulting, and the patient being reduced to a very anæmic condition, six months later I removed the entire uterus. In the one case, which terminated fatally, the tumour was very large, weighing 22 lbs. I commenced the operation with the intention of fixing the stump extra-peritoneally; but, in tying the broad ligament on the left side, I unfortunately transfixed a large vein, and a hæmatoma resulted—in trying to remedy which, I lost much time and was only partially successful. Thinking that a sloughing stump would prove a dangerous neighbour to a hæmatoma, I extirpated the cervix per vaginam. The patient died on the third day.

In one case I removed a cancerous uterus, which, though not complicated with myoma, was too large to extirpate per vaginam. The method adopted was similar to that above described, but the patient died of septicæmia.

PORRO.

I performed Porro's operation upon a patient who was sent into the Lying-in Hospital with rupture of the uterus, extending into the posterior fornix of the vagina. The fœtus had entirely escaped from the uterus, which on abdominal palpation could be felt firmly contracted in the left iliac fossa. At first I mistook it for the fœtal head, but this was subsequently discovered in the vagina. The child having been extracted with forceps, a quantity of blood and clots came away. Following up the funis, my hand passed through the rent, which was, of course, at least as large as the circumference of the fœtal body which had passed through it; having removed the placenta from amongst the intestines, and washed out the abdomen with hot water, hæmorrhage continuing to an alarming extent, I opened the abdomen, and, the control of the bleeding by the most rapid method being a vital necessity, I applied an elastic ligature around the cervix, and removed the uterus. Having secured all the other vessels not included in the ligature, I sewed up the rent in the posterior fornix as well as I could, washed out the abdomen, and drained per vaginam. The patient collapsed.

CÆSAREAN.

There were three cases of Cæsarean section, which I shall bring forward again in the Report of the Lying-in Hospital. All the mothers and two of the children survived.

EXTRA-UTERINE FŒTATION.

Abdominal section was performed in three cases of extra-uterine fœtation, one of which has been already mentioned, and the other two I brought forward before, and are fully detailed in the Transactions of the Academy. Two mothers recovered; and one, on whom I operated because of putrefaction of a large hæmatocele, died.

BROAD LIGAMENT CYST.

I operated recently upon a large cyst of the broad ligament. The patient had recovered from an attack of general peritonitis some years previously, and, in consequence of this, the intestines were so firmly and so universally adherent, that the operation was one of great difficulty. I succeeded, however, in evacuating the cyst, and stitched the edges of the opening to the abdominal wound. I did not, however, succeed in freeing the intestinal adhesions, which was one of the objects of the operation, and a fæcal fistula, which has almost closed, resulted from my attempts to do so.

PERITONITIS.

In four cases I performed abdominal section for peritonitis. In one of these there was a wandering spleen, the patient recovered from the operation, and went home; but the fluid re-accumulated, and her medical attendant was obliged to tap her. I have not heard of her since. Another was a case of tubercular peritonitis. I performed abdominal section, and removed a large quantity of ascitic fluid, and also the ovaries and tubes, which were extensively diseased. The fluid, however, rapidly re-accumulated, and I performed a second abdominal section, and on three subsequent occasions tapped her with a

trocar and canula. After the third tapping she got a purulent peritonitis, and I was obliged to perform a third abdominal section, leaving in a rubber drainage tube. She also got pleurisy on the left side, for which I was twice obliged to tap her chest; but, contrary to all our anticipations, she ultimately recovered, and went home well. A third case was diagnosticated as suppurating hæmatocele, and presented all the physical signs of that disease. On opening the abdomen the peritoneum was found about three-fourths of an inch thick, and, having divided it, I unfortunately cut through the peritoneal and muscular coats of the subjacent intestine; but this I immediately closed with sutures. I then passed my finger down the back of the uterus, into Douglas' pouch, and evacuated a quantity of pus; washed out the cavity with hot water, and drained it per vaginam. Six weeks later a fæcal fistula formed, and she ultimately died of marasmus three months after the operation. The *post-mortem* examination revealed general tubercular peritonitis, and three distinct collections of pus in different parts of the abdomen. There was one case of purulent peritonitis following childbirth. The patient had been delivered in another hospital. The pus was localised in the anterior part of the abdomen, and pointed about two inches below the umbilicus. I evacuated about two pints by a free incision, and inserted a rubber drainage tube. She made a rapid convalescence.

INTESTINAL ANASTOMOSIS.

A very interesting case was one of ileo-uterine fistula. When the patient was admitted into the Rotunda, she defæcated entirely through the uterus. From the character of the fæces, and the history of the case, it was evident that the uterus had ruptured during labour and that a coil of small intestines had become strangulated in the rent.

Upon opening the abdomen I found a loop of the ileum attached to the lower part of the posterior surface of the uterus. Having detached it and brought it out of the abdomen it was found necessary to resect about two inches of the damaged portion; the divided ends were closed, and the intestinal canal restored by anastomosis by means of bone plates. She made an excellent recovery, and when last heard of was working in the fields.

NEPHRECTOMY.

There were two nephrectomies—one for scrofulous kidney, and one for hydronephrosis of a wandering kidney. In the former I removed the organ by a lumbar, and in the latter by an abdominal incision, and I have no hesitation in giving the preference to the latter method. In the first case the kidney was full of abscesses, and enlarged to about four times its natural size. The patient was dreadfully emaciated, so that I could see no circumrenal fat, and the peritoneum was adherent to the anterior surface. In separating these adhesions I tore through the membrane, and a quantity of blood and tubercular matter escaped into the abdomen. Having removed the kidney, and closed the lumbar incision, I turned the patient upon her back, opened the abdomen, and washed it out with hot water. The patient made a good recovery, and has gained three stone in two years. A hernia, however, formed in the abdominal wound, for which I operated successfully about six weeks ago. The indication for operation in the second case was periodic violent pain. The incision was in the linea semilunaris, and I encountered no difficulties. Both patients recovered.

PROLAPSUS RECTI.

Abdominal section for prolapsus recti sounds rather heroic; but in the case in which I operated, the uterus

was adherent to the rectum; and when the latter came down, the uterus followed, passing out of the anus fundus foremost. Having opened the abdomen, and drawn up the uterus, I separated the adhesions which connected its posterior surface with the rectum, and finally stitched it to the abdominal wall. The uterus maintained its position, but the mucous membrane of the bowels came down again after some months of complete relief, and required local treatment.

UMBILICAL HERNIA.

The umbilical hernia I operated upon by Sänger's modification of Mr. L. Tait's flap-splitting method. In this the fibrous ring surrounding the opening is split with scissors, and the flaps thus formed are turned outwards and inwards, the deeper ones being united by a continuous cat-gut suture, and the superficial by an interrupted suture. The result was excellent.

EXPLORATORY.

There were six exploratory incisions: four were in cases of inoperable cancer, of which three died. One was a case of pelvic suppuration; she died, but I do not think the operation accelerated the fatal issue.

The sixth was a peculiar one. The patient, an unmarried girl, had an abdominal tumour, about as large as an adult head, which caused her very great pain. It was soft, but did not give me the impression of containing fluid; and being intimately connected with the uterus I had no doubt that it was a soft myoma, and advised operation to relieve the pain. On opening the abdomen, however, I came upon a large hæmatoma. I closed the abdomen again. The patient made an excellent recovery, and after two months no trace of the tumour was to be felt.

These cases comprise all the abdominal sections per-

formed in the Rotunda Hospital between November 1, 1889, and October 31, 1892.

Dr. Alfred Smith said, in the first case of ovariotomy a very peculiar accident happened, and that was the hæmorrhage which could only be arrested by the perchloride of iron, with the result that a band of adhesion formed from the cervix which caused strangulation of the intestine and death of the patient. He thought it was a mistake to have used the perchloride of iron. He himself used infusion of matico and found it to answer very well. He thought in this case the sloughing and fresh adhesions were due to the perchloride of iron. Under the head of uterine appendages a very interesting point occurred to him, and that was with regard to resection of the ovaries. He meant the case in which the ovary was not removed in the hope that the woman might be able to bear children. This innovation was brought about in Germany, but he thought that where there were evident adhesions it was almost useless to leave a small portion of the ovary behind. Therefore, unless they could make out whether the Fallopian tubes were pervious or not, leaving a small portion of the ovary would be useless. Under the head of myomata he would like to ask Dr. Smyly what points guided him as to why in some cases he removed the appendages whereas in others he performed the larger operation? there were only four cases in which he removed the appendages; was the larger operation absolutely necessary to recovery? The proportion of the simpler operation seemed to him to be a small one. He was very glad that he did not follow the method of sinking the pedicle. He thought it a very bad operation, although the result had been fairly good. Still, when one thinks of the amount of surface that is likely to slough, and of the hæmorrhage, it is an operation that is likely to fall into disuse. Dr. Smyly seemed to be quite in favour of the entire removal of the uterus; but they should be aware of the dangers which are likely to follow entire removal of the uterus. Recently a great number of cases of intestinal obstruction followed this operation. It was found that the cause was due to the intestines becoming adherent to the fresh wound over the vagina, and a great number of cases were lost. The method of enucleation was done very seldom in this country, but he thought it was one

which deserved to be done oftener, because it leaves a very good uterus behind. He would like to know if Dr. Smyly experienced any trouble in enucleating this fibroid tumour, as in cases which he had seen there was a considerable amount of hæmorrhage, with difficulty in arresting it. Another point of interest was that under the head of peritonitis. His experience was, that if it is general septic peritonitis, it is absolutely useless to operate. If it is localised, then you may operate satisfactorily. In tubercular peritonitis he thought draining and washing out the peritoneal cavity does not do much good. The method of draining the peritoneal cavity, drying it and powdering it with iodoform gave much better results.

Dr. Atthill said, under the head of ovariotomy they had forty-three cases and out of these seven deaths, which at the first blush would be a very excessive mortality. But when they came to look at the details of the cases they were absolutely unreal. In the first case—the girl of nineteen—her abdomen was full of fluid, and the right side of her thorax was tapped twice, and on opening the abdomen it was found to be a mass of malignant disease. He did not think that should come under the head of ovariotomy at all. Then, No. 3 was three weeks previously in another hospital, and was pregnant; in fact she was in the very worst possible state for operation. Then, No. 4's abdomen was full of colloid matter. Lastly, they had the dermoid case, which was also a colloid cancer. He thought these four deaths should be removed, which would leave only three deaths in forty-three. With regard to removal of the appendages his own experience was borne out, and the only deduction he could make was that removal of the appendages ought to be considered a very serious operation, and not to be lightly undertaken. His own experience was, that he would prefer cases of ovariotomy to cases of removal of the appendages. In complete hysterectomies they had only one death in five, and that led him to infer that complete hysterectomy is not so dangerous as the operation of amputating the uterus about the centre and treating the pedicle externally. With due respect to Dr. Smith, he often used perchloride of iron in the abdomen, and he never found it very dangerous.

Mr. Foy said, with regard to the styptic properties of matico that no fluid preparation of it had any such power. It possessed this property by virtue of the ridges in the under surface of its leaf. He thought it a strange thing that the best preparation of iron—*i.e.*,

the persulphate—was not used. Even this had not the styptic power of chloroform and the latter does not cause clots. He thought that the fatality attaching to the operations was owing to the fact that women were allowed to go to the verge of the grave before they were operated on. He hoped that the example of Dr. Smyly, who had placed before them his failures as well as his successes, would be carried out by all succeeding operators.

Dr. Parsons said a point of interest was the extreme rarity of one kidney being affected with tuberculosis and the other not. He would like to ask Dr. Smyly whether when the woman returned to hospital two years later there was any pus in the urine or any tuberculosis in the other kidney.

The President said, the first remarkable thing that struck him was the enormous number of tube cases that Dr. Smyly happened to meet with in the three years; in fact they formed oné-sixth part of all abdominal sections. Up to recent years in Dublin it was considered that women never had enlarged tubes, and it simply arose from the fact that they had not been diagnosticated. When one came to deal with the living, and was about to justify an operation, he had first to consider as to the recovery of the patient, and, secondly, as to whether the operation would diminish her sufferings; and this is one of the most difficult questions to decide. He had come across patients who had both ovaries and tubes removed and still their sufferings were very intense, so that a bleeding fibroid of itself would not necessitate removal of the pathological mass. Over and over again he saw women suffering from hæmorrhage, and when the characteristic period appeared the tumour reduced considerably in size. It would be an interesting point if a complete record of these cases of laparotomy were kept, and then after a year or two to know if any complications occurred, and how many returned to perfect health. Perhaps Dr. Smyly in his next Report would be able to give us a short *résumé*.

Dr. Smyly, in reply, thanked sincerely all the gentlemen who spoke on his paper. As to the results of the operations he stated them as they occurred, without any object in view. To classify all the abdominal sections he found a matter of great difficulty. They might get 200 ovariotomies without any complications, but his cases did not come forward in that way, and he had to try different kinds of classification. From the percentage of mortalities he considered the operation for pyosalpinx a very dangerous one. He agreed with all that Dr. Smith had said. The reason he used

the perchloride of iron was because it was highly praised by Tait, who has had a large experience. Then as regards the choice of operation in myoma; he found that many of these small tumours did not want to be operated on at all, and that is why he removed so few of them. In operating for hæmorrhage, he would certainly remove the ovary. He learned from experience that in cases of general septic peritonitis abdominal section was useless, but in localised or tubercular peritonitis he thought it had done great good. Then as to myomectomy; that, of course, was the typical operation, but he did not care for it if it took the patient to the cemetery; and, so, unless cases happened to be very favourable he would rather take the entire uterus. One of the cases of death from hysterectomy was due to a mere accident, and he found the enucleation of the tumour from the substance of the uterus the most dangerous, with the exception of enucleation from the cellular tissue of the pelvis. In reply to Dr. Parsons he said the urine from the one kidney did not contain any pus, and the patient was now a fine fat girl.

ON THE REMOVAL OF THE GRAVID UTERUS BY ABDOMINAL SECTION.

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[Read in the Section of Obstetrics, April 21, 1893.]

In a former volume of the Transactions of this Academy I reported a case in which I had been obliged to amputate the gravid uterus. In the present communication I desire to submit the notes of a recent case of the same kind, and to offer some general observations on such operations.

In the last case referred to, in which I performed a Porro-Müller's operation, the patient was a woman, aged thirty-three, two months pregnant, and of well-marked carcinomatous cachexia, suffering from a fast-growing uterine tumour, which, from the intense suffering it occasioned, the rapidity of growth (it having developed from the time it was first recognised, only three months previously, so as to fill the abdominal cavity, and cause such dyspnœa as to prevent her sleeping save in a sitting position), as well as from the extreme emaciation and characteristic cachexia, I considered probably malignant. The symptoms being most urgent, and the patient being apparently *in extremis*, it was decided as a forlorn hope to give her whatever chance the removal of the uterus might afford. From the time of her being brought into hospital until she was placed on the operating table the patient was in a condition of extreme prostration from loss of rest, continual pain, and inability to take food, and was apparently kept alive by the free adminis-

tration of stimulants. In that operation, which was performed on April 13th, 1893, I had the able assistance of my colleagues, Drs. Lentaigne and Coppinger, and also that of Dr. A. Smith, of St. Vincent's Hospital. The enormous tumour growing from the fundus of the uterus was, as shown by the specimen exhibited, partially gangrenous, and owing to extensive adhesions there was considerable difficulty in the necessary uterine removal and in the ligation of the ligaments. The operation was therefore necessarily prolonged; and though she recovered from the immediate shock, and for a couple of days gave hope of recovery, her condition of extreme prostration was never completely recovered from, and she succumbed at the end of a few days.

I am indebted to my colleague, Professor M'Weeney, for the following note of the pathology of the growth:—

"The tumour, which was of enormous size, grew from the fundus uteri, and consisted of two parts. The apical portion—*i.e.*, that furthest removed from the uterus—was in a state of sloughy degeneration, and had softened down so as to form a sort of cyst, the wall of which was composed of discoloured and unhealthy peritoneum. This portion passed gradually, and without any definite line of demarcation, into the proximal or basal portion of the growth. The latter consisted essentially of unstriped muscular fibre and connective tissue, associated in varying portions. The most deeply-situated portion had undergone mucoid degeneration, so that the middle of the tumour was channelled with numerous inter-communicating cavities, filled with glairy fluid. Hence the growth may be regarded as a monstrous, non-pedunculated fibroid."

The excision by abdominal section of the gravid uterus, above the cervix, which is generally known by the name of the operator, Professor Porro, of Pavia, by whom it was first successfully accomplished in 1879, though previously performed by Dr. H. Storer, of Boston, was originally designed as an obstetric operation in lieu of the Cæsarean section—

being, as Porro defined his operation, "utero-ovarian amputation completing Cæsarean section." It has been subsequently considerably modified and improved in its technique by Freund, of Breslau, and Müller, of Berne, to whose operation, with some further modifications, I have myself resorted in three cases of pregnancy complicated by urgent symptoms arising from malignant, or supposed malignant, disease of the fundus or body of the uterus.

Premising that the Müller-Porro operation consists essentially in making a large abdominal wound, with the view of excising the gravid uterus and securing the cervix by serre-nœud, ligature, clamp, or otherwise, previous to opening the uterine cavity and removing the child, I may now describe the steps of this operation as adopted in the method followed by myself in the cases referred to. The preliminary measures—directions concerning arrangement of operating room, position of patient, choice of anæsthetics, and antiseptic precautions necessary in a case of abdominal hysterectomy—being identical with those in ovariotomy, need not be here detailed. Taking it for granted, therefore, that these preliminaries have been properly carried out, and that the patient about to undergo removal of the uterus has been fully anæsthetised, and placed in proper position on the operating table, the first step in the operation, after the bladder has been emptied by the catheter, is the incision through the abdominal parietes, by which the peritoneal cavity is to be laid open and the uterine tumour exposed. This incision along the linea alba from an inch below the umbilicus to an inch above the pubes, differs from that generally necessary in ovariotomy in being necessarily of much greater length, so as to facilitate that free intra-peritoneal manipulation by which, in hysterectomy, the uterus is to be liberated from adhesions, and the broad ligaments ligated and divided.

2nd. As soon as the uterus has been thus brought into

view any morbid adhesions to the bladder or other viscera are to be cautiously, and, if possible, manually broken through, and any bleeding points or thick bands of adhesion so broken securely ligatured.

3rd. The uterus is now to be drawn upwards and forwards, so as to put the broad ligament and cervix somewhat on the stretch.

4th. The broad ligaments are then to be seriatim transfixed by a blunt pedicle needle armed with double strong silk sutures, by which the ligaments should be firmly ligatured in two or three divisions. Immediately below these another stout ligature should be encircled around each ligament. These latter ligatures must then be confided to an assistant, by whom, before the closure of the abdominal wound, the remaining portion of undivided broad ligaments should be again drawn into view, prior to the sutures being cut to ensure that the included vessels are effectually closed. The same object may also be accomplished by the use of either Reeves' hysterectomy forceps, Storer's clamp shield, or Wells' compressing pedicle forceps.

5th. The broad ligaments may now be divided above the sutures by a scissors on each side of the uterus, which, together with the included ovaries and Fallopian tubes, now remains attached only by the cervix.

6th. The cervix may now be included either in a serre-nœud or a hysterectomy clamp forceps, sufficiently low down to allow its transfixion, by a blunt-pointed pedicle needle armed with double stout wire or carbolised silk suture, so strong as to allow of that force by which the ligatures can be so tightened as to obviate slipping and consequent hæmorrhage from the subsequent retraction of the undivided tissues. In this way the cervix must be ligated in two portions. Below these ligatures two transfixion pins should be passed at right angles through the cervix, and below these again it should be

tightly encircled by a stout silk or carbolised whip-cord ligature.

7th. Above all these ligatures, the uterine cervical zone is now to be slowly divided by a strong, round-pointed scissors and removed.

8th. The cervical stump or pedicle may then be treated either by searing it with thermo-cautery, as in my last case, or, as in my previous ones, closed by the flap operation and covering it with peritoneum by fine silk or gut sutures. The clamp forceps can now be relaxed, and, if there be no hæmorrhage, the cervical stump should be secured either by the transfixion pins or by clamp in the lower angle of the abdominal incision, where, after the closure of the upper part of the wound, having been freely dusted with iodoform, it must remain to be treated extra-peritoneally.

9th. The abdominal cavity is then to be flushed out with warm boric solution, after which, the sponges and forceps having been carefully counted to prevent risk of any being left behind, and the ligatures having been also looked to, the abdominal wound may be closed and dressed as in an ovariotomy, except in one respect—that is to say, in Porro's operation the lower angle of the wound should be left unclosed by sutures, so far as may be necessary, to allow space for a drainage-tube, as well as for the cervical pedicle, which must, as I have said, be treated by the extra-peritoneal method. This is conceded by the great majority of authorities, although my friend Dr. M'Ardle, himself a successful operator, in such cases still rather favours the extra-peritoneal method of dealing with the pedicle in uterine amputations as in ovariotomy. One of the many differences, however, between these procedures is the extreme difficulty generally experienced in preventing hæmorrhage from the pedicle in the former, and hence the advantage of having the cervix in view after Porro's operation in case any such hæmorrhage should occur.

It is needless to add that during and after no operation is unremitting attention to perfect asepsis, and to all antiseptic precautions, more essential than in that which I have now described my method of performing.

This operation differs, as will be seen, in several respects from Müller's modification of Porro's operation. It is still more distinct from Freund's operation for the extirpation of the non-gravid uterus, with which, as an examiner, I have found the latter procedure is not unfrequently confounded. To illustrate clearly that distinction I shall, therefore, here briefly describe Freund's operation as performed in a case under my observation. In Freund's method of hysterectomy, the abdominal cavity having been laid open, as in ovariotomy, the broad ligaments are transfixed and ligatured in two or three portions on either side, so as to secure above the sutures the Fallopian tubes and ovaries, and to seal the ovarian and uterine vessels, the lower ligature being brought out into the vagina. The uterus is now cut away from its vaginal and ligamentous connections and withdrawn through the abdominal wound, which is subsequently closed as in ovariotomy; whilst the ends of the remaining ligatures in the broad ligaments are brought down into the vagina, about which the anterior and posterior layers of pelvic peritoneum are previously brought together by silk or gut sutures, so as to close the peritoneal cavity, a drainage-tube being then left in the vaginal wound. My own opinion and very limited experience of Freund's method of abdominal hysterectomy is similar to that of many other surgeons, by whom some years ago it was more largely resorted to, and by most of whom (although more facile than vaginal hysterectomy, and possibly capable of some future improvement), owing to its terribly unsuccessful results—the consequent mortality being over 70 per cent.—it has been generally abandoned. On the other hand, the mortality of Porro's operation under the most

favourable circumstances, that is, ino bstetrics where the condition of the uterus is presumably a normal one, according to Sir Spencer Wells, is 56 per cent. of the mothers so operated on; hence the results in my cases of removal of uterus for such disease as existed in all these cases—namely, two deaths and one recovery, being a mortality rate of 66·6 per cent., or considerably less than that of Freund's operation—are by no means exceptionally unfavourable when we consider the circumstances of these cases and the condition of the patients so operated on, as the last possible chance of relieving suffering and prolonging life in cases apparently otherwise beyond hope. At the same time I must add that I think it only justifiable to perform such operations, as was the case in the three instances above referred to, in compliance, as a *dernier ressort*, with the entreaty of a patient fully aware of all the risk of the procedure and beyond other methods of relief.

Finally, it may be added, that in obstetric practice, in which Porro's operation was primarily designed as a substitute for Cæsarean section, there can be no ground now-a-days for recourse to either that operation, or any of its subsequent modifications, inasmuch as within the last few years, owing mainly to the improvements in the technique, and consequently in the results, of the oldest of all intra-peritoneal operations, effected by Professor Sänger, of Leipzig, and also, and above all others, by Professor Murdoch Cameron, of Glasgow, the Cæsarean section (my first case of which was reported in my chapter on this subject in "The Dublin Practice of Midwifery," published twenty-one years ago) has been robbed of its former terrors. No triumph of modern abdominal surgery has probably been equal to that which has taken place in the performance of this operation by the method of Cameron, by whom the Cæsarean section has been accomplished in 20 cases with only two deaths,

being a mortality hardly greater than that generally obtained in ordinary ovariotomy. With that method thus available, and with the exceptional experience of Cameron to guide us, it is, I think, therefore evident that we should no longer be justified in obstetric practice, in resorting, whether by Müller-Porro's or by Freund's procedure, or by any other method, to operations so commonly fatal as either the complete removal or the amputation of the gravid uterus have hitherto proved, and in all probability must always remain.

Dr. Lane would like to know could Dr. More Madden assign any cause for this rapid growth in what would appear to be a monster fibroma.

Dr. Tweedy asked if he had any reason to believe that the disease was confined to the uterus, and had not spread to the surrounding tissues. He did not see the necessity of washing out the abdominal cavity if nothing had got into it. If the blood has ceased, and if the clots have been taken away and asepsis assured, he did not see the use of a drainage-tube; it often ended in a fæcal fistula.

The President said that Dr. More Madden appeared to think, from the constitutional symptoms present, that it was a case of malignancy. But then the woman was only thirty-three years of age, and there was no matting of the tissues, no disease of the cervix uteri. Another remarkable coincidence was the absence of ascites. The late Dr. Stokes always laid down that in such cases ascites was a sign of malignancy. The difficulty, to his mind, was how to account for the sloughing of the tumour. He thought that they must bow to the pathologists and agree with them that it was a large fibroid of the uterus. With regard to the choice of operation, he would be more inclined to the ideal operation—*i.e.*, removal of the uterus complete. He did not see the advantage of the drainage-tube.

Dr. More Madden, in reply to Dr. Lane as to the nature of the tumour, said that he (Dr. Madden) submitted entirely to the decision of the pathologist to the hospital, Dr. M'Weeney, but, at the same time, he ventured to think that before abdominal section any man might be justified, from all the symptoms—the extremely rapid

growth, the constitutional cachexia and incessant local pain—in diagnosticating it as being probably malignant. As to washing out the peritoneal cavity, he must say that when the operator's hands, and possibly the hands of the assistant, have been introduced into the peritoneum, he very much preferred washing out the cavity, because no amount of washing of hands or boiling of instruments can, *per se*, altogether prevent the risk of septic infection. He was not aware of any actually effectual means of sterilising the atmosphere in the operating room, so as to prevent access of micro-organic germs of disease that might be thus conveyed to the wound, and therefore he thought washing out a wise precaution, and he would always continue to do it, at least until some better or more reliable method of lessening the risk of septicæmia following such operations might be discovered. He did not like the drainage-tube much, but in any operation where there was obviously great danger of septic contamination, he thought they could not take too many precautions. And whatever might be the disadvantages in other respects of drainage in laparotomy operations generally, and fully as he recognised the importance of the reasons urged against that course, nevertheless, in cases like that now under consideration, it must be said in favour of the drainage method that it affords a means by which the surgeon may, if that should subsequently become neces-ary, wash out the peritoneal cavity through the tube.

CASE OF DEEPLY-MARKED PURPURIC SPOTS IN CONGENITAL SYPHILIS.

By JOHN H. GLENN, M.D.;
Senior Assistant Master, Rotunda Hospital.

[Read in the Section of Obstetrics, April 21, 1893.]

THE following case of purpura in the newly-born may prove interesting:—

The mother was a primipara of twenty-two, had suffered from epistaxis several times during her pregnancy, and was in fairly good health though delicate looking. She had no history of syphilis as far as could be ascertained. The baby was born on Wednesday, April 12, and was asphyxiated, but came round after Schultzing for half an hour and the administration of oxygen, and lived for thirty-six hours. The child was covered over with discrete hæmorrhagic spots, especially the face, chest, and back. It weighed 4½ lbs., and measured 17 inches in length. On auscultating we found a loud bruit most intense over the tricuspid area.

Dr. Earl kindly made the *post-mortem* examination, and reported—

"The spleen was very much enlarged and of a deep red colour, being firm to the touch. There was considerable perisplenitis, weight 45 grammes—the spleen of a normal newly-born child weighs 6 grammes. There was no ascites. The liver was slightly enlarged and deeply stained with bile; it was also firm to the touch, while the healthy liver should be soft. The condition of the spleen and liver points strongly to congenital syphilis.

"With the exception of a few hæmorrhages on the surface the kidneys were normal.

"The stomach and intestines were covered with purpuric spots

similar to those on the skin. Both visceral and parietal layers of the pleura were studded with minute hæmorrhages.

"There were hæmorrhages of considerable size in the substance of the lung; the pericardium was also studded over with hæmorrhages.

"The foramen ovale was open and allowed passage of blood from the left to the right auricle.

"The auricular surface of the tricuspid valve was studded with minute vegetations of a bright red colour; the left ventricle was normal, as were also the large vessels. The œsophagus and mouth were also covered over with hæmorrhagic spots. The bones, as far as could be observed, were normal."

A SUCCESSFUL CASE OF PORRO'S OPERATION.

By NICHOLAS WHISTLER COLAHAN, M.D., M.Ch.;
Professor of Materia Medica and Therapeutics, Queen's College, Galway

[Read in the Section of Obstetrics, May 26, 1893.]

THE case I have the honour to bring under your notice to-night is one of pregnancy occurring in a rachitic dwarf, in which it became necessary for me to perform abdominal section, delivery being impossible *per vias naturales*. Porro's Cæsarean hysterectomy was the proceeding I adopted to complete delivery. The operation was performed on the 16th May, 1892, and was completely successful in saving the lives of both the mother and her child. On the 18th February last, nine months after the operation, I had an opportunity of showing both mother and child to some members of the Academy, who happened to be in Galway on university business. The case is interesting, and, as far as we in this country are concerned, it has still, to a certain extent, the attraction of novelty for us. In April, 1891, I find, Dr. Bagot described the first successful case of Porro's operation performed in Ireland. Dr. More Madden, in his recent communication to this Section, on 28th last month, I find, also, mentions a successful case. As far as I know this is the third, and the first, I believe, in which mother and child were saved. I dwell upon these facts, for I believe it would be both important and interesting to learn why abdominal section for obstetric purposes is rare in this as compared with other countries, for there is no doubt that both Cæsarean section and the Porro-Cæsarean operation are

growing rapidly in favour in England, as well as on the Continent and in America. Is it that cases are not forthcoming suitable for these proceedings? or is it that we still prefer the time-honoured methods whereby the instrumental death of the child gives, as we were wont to think, greater hope for the safety of the mother, and that we refuse to recognise, except in a few exceptional cases, conditions which would warrant us in advising or undertaking abdominal section. [Photograph of patient here shown.]

CASE.—This little patient, B. C., a rachitic dwarf, forty years of age; 39 inches high; unmarried; menstruated last July, 1891; became pregnant in August, 1891, was admitted to lying-in ward of hospital on Saturday, 14th May, 1892. On Sunday, 15th May, labour, at term, set in; pains rather irregular; ordered an opiate. On examination I found it difficult to reach the os, which was drawn very high up, but the promontory of the sacrum was discovered protruding as a sharp wedge, leaving the conjugate under two inches. It was evident that delivery could not be effected through the natural passage, and, after consultation with my colleague, Dr. Lyden, it was decided that abdominal section should be resorted to, and I determined to send the patient to the County Infirmary, where I could most conveniently perform the operation, and where I would further have the advantage of having the after treatment carried out by an excellent nurse. Accordingly, on the evening of Sunday, 15th May, the patient, in charge of an experienced midwifery nurse, was taken to the infirmary. It is important to note here that the pains which had been very irregular during the day, and had almost disappeared towards evening, again set in, perhaps owing to the excitement of having to leave for the infirmary, and before reaching the latter place the membranes gave way, and the waters were discharged. However, on being made comfortable in bed, and an opiate administered, matters again became quiet, and late on Sunday night my resident pupil at the infirmary reported to me that the patient was very quiet, and taking her nourishment. Early on Monday, the 16th, my colleague, Professor Lynham, also saw the patient with me, and we decided that abdominal section should be performed as soon as possible.

Dr COLOHAN ON PORRO'S OPERATION.

From Photo.

F. Huth, Lith. Edin.

Accordingly, all necessary arrangements were made. An airy ward with single bed was warmed up with a small fire. The carbolic spray was allowed to impregnate the atmosphere while the other arrangements were progressing. A small narrow table near the window was used to operate upon. A few sponges wrung out of a 1 in 40 carbolic solution, boracic absorbent wool, and alembroth gauze were the dressings used. Silver sutures were, in the absence of reliable gut or silk ones, arranged for the abdominal incision, and the instruments selected were extremely few and simple; finally, a solution of perchloride of mercury, 1 in 4,000 of boiled water, was used to sponge out the peritoneum and other exposed parts.

I believe the success of these proceedings depends much upon the rapidity with which they are carried out, and I believe that rapidity, with strict attention to details, depends entirely upon a perfect understanding between the operator and his assistants. I therefore wrote out, as shortly as I could, on a slip of paper, directions for each assistant—what I wished him to be prepared to do for me, and the period of the operation when I would require his services. I was very pleased with the result. There was neither flurry nor anxiety; I felt that every movement and wish of mine was followed and anticipated, and not for one second from start to finish was there a check in the operation, which occupied under twenty-five minutes. I merely notice one or two difficulties that arose during the operation. I mentioned that the waters had already been discharged; this rendered the abdominal wall very lax; the uterus was further tilted to the left side, and it was quite impossible to be certain that the external incision was in the line of the linea alba. I was obliged to open the sheath of the rectus, and passing a probe between it and the muscle on either side, I found I was fully an inch to the left of the middle line. This may be a point of importance. The abdominal incision reached from the umbilicus to within about two inches of the pubis; and although the uterus was well pressed forward into the abdominal incision, yet several coils of distended bowel leaped out on all sides, and were it not for the inevitable flat sponges would have given serious trouble. It is a pity that these said sponges have such a tendency at the most critical period of the operation to conceal themselves, and remain behind. I was not spared this experience, but the sponges were previously numbered, so the delinquent was quickly discovered.

The uterine incision was done by cutting; no effort was made to fix the placental site, but a small incision was made in the middle line at the fundus; two fingers were introduced, and, using these as a guide, with a probe-pointed bistoury the thick uterine wall was quickly run through, down to the pubic end of the abdominal incision. I was glad I determined to cut, for the uterus, having contracted after the waters were discharged, the thick walls would not, I fancy, have torn kindly. Two or three sinuses bled to an alarming extent, but were quickly controlled. The contracted uterus jammed the infant so tightly down in the pelvis, that I was obliged to take the probe bistoury again and extend both the uterine and abdominal incision downwards. Even then with difficulty was the child liberated. It was a full-sized infant, with a well-marked hydrocephalic head, and, a further difficulty, the funis was twice coiled round its neck. The cord was clamped and cut, and the child given to the nurse. I think this is a critical period in the operation. The child having been liberated, the uterus very suddenly becomes small, and ceases to fill the abdominal wound as it did, therefore fluids and blood can more easily enter the abdomen. Further, the distended bowels, kept in restraint till now, burst out on all sides, greatly to our embarrassment. In this way they got covered with blood and other fluids, which they carry back into the abdomen to the danger of the patient. To meet this difficulty I thoroughly sluiced the protruded bowels each time they appeared with the perchloride solution before returning them to the abdomen. It is a good practice, for it saved what would have been afterwards a troublesome peritoneal ablution.

I was obliged to remove the placenta while the uterus was still in the abdomen. It was a large one, and to have taken it away with the uterus would have necessitated some forcible tugging. All through this period Dr. Lyden, with a finger in each end of the incision, kept the uterus well pulled forward, and when everything was ready swept it out of the abdomen, and, giving it a half turn, brought it down towards the pubis. This effectually stopped all hæmorrhage, and I was able quietly to suture the abdomen with seven silver sutures—the first drawing the abdominal wall tightly round the pedicle, the other six embracing the entire thickness of the abdominal wall and peritoneum. The uterus was now put well on the stretch, and two stout steel pins shoved through the utero-vaginal pedicle. I had not a serre-nœud, and I was not

certain of the elastic ligature I had with me, so I encircled the pedicle below the pins with a double strand of stout whip-cord. This I certainly would never do again. It was, I think, the one weak spot in the operation, and nearly cost my patient her life.

The uterus was now cut away, the stump shaped and dressed with iodoform, alembroth gauze, and boracic wool. The abdominal incision was dressed separately in the same way; and, finally, a warm flannel binder was drawn firmly over all. The A. C. E. mixture was the anæsthetic used by Professor Lynham. There was some vomiting afterwards, which, fortunately, did not last very long. On the whole, the little creature bore the operation remarkable well, and when placed in bed expressed herself as comfortable. It was evident, however, that she was very weak, and I kept near her for some time. It was well that I did so, for in a very short time, perhaps owing to effort of vomiting, I noticed that the wool plug over the pedicle was saturated with blood, and I at once saw that the stump was bleeding freely. This very undesirable accident would not have occurred with the serre-nœud, nor with the elastic ligature; in fact the serre-nœud would have been the proper instrument here, where the pedicle was healthy and fleshy, the elastic ligature when it is poor and friable. However, having neither, I applied another coil of whip-cord beneath the pins, applied the thermo-cautery freely to the bleeding points in the stump, and all appeared right again. The shock to the system after Porro's operation, where there is not only an abdominal section, but, in addition, the removal from the body of an important organ, is the one great drawback to this proceeding. It is well to bear this in mind, and I believe the patient should be well supported from the first. In this particular case, milk, Brand's beef jelly, and iced champagne were given rather freely at stated times. The temperature never rose above 101°, which it reached on the third day, never afterwards. On the seventh day, while dressing the stump, the patient got a severe rigor. Soon after enormous distension and tympanites set in; one of the sutures gave way, and had to be replaced, in order to relieve the strain on the others, but the prompt use by the nurse of O'Beirne's tube relieved the flatus, and an enema moved the bowels, and what appeared an impending attack of peritonitis was averted. It is at such moments as these that skilful nursing saves the position, and turns the tide in our

favour. On the eighteenth day the pedicle came away, and at the end of the third week the little patient was permitted to move about, and the infant seemed nothing the worse for his novel method of entering the world.

It may be asked—why did I not adopt the true Cæsarean section with uterine sutures, instead of removing the uterus after Porro's method? Well, I am as suspicious of the absolute reliability of statistics as most men—yet when we are in doubt and anxiety we find ourselves consulting them, and they often sway us one way or the other.

In my hurried search I gathered—1st. that in a general way at least Porro's operation is the easier and more rapid proceeding—tedious uterine suturing being avoided. 2nd. I fancied I learned that a *true Porro's operation, with a sound uterus and a viable fœtus*, carefully done, and at a proper period, is at least as successful as the most carefully performed Sanger or Cameron-Cæsarean section. And lastly, looking at my little patient, and learning from the experience of others that these little people having escaped from the dangers of one pregnancy have a peculiar facility of getting entangled in a similar predicament again, I saw no reason why I should hesitate to deprive her of the chance of such a calamity, and myself, perhaps, of a further period of trouble and anxiety.

I have to express my thanks for being permitted to bring this case before you at this very advanced period of the Session, when many pressing matters have still to be considered. I trust, however, it may be useful in inducing others to pause before habitually resorting themselves, or advising others to resort to, the older method of infantile mutilation in obstructed labour to the exclusion of abdominal section; and useful further in proving that with strict attention to details, and with careful antiseptic

precautions, this very serious obstetrical operation can be undertaken with a very fair chance of success.

Dr. Smyly said it was a matter of surprise to him that in this country of all the countries in the world Porro's operation should be such a rare thing. There were two things which probably accounted for it—one was the distrust of the people in this country to be operated on; the other was that many practitioners would rather let their patients die under their own care or send them over to England. He did not agree with Dr. Colahan that the results of Porro's operation were equally good as compared with Cæsarean section. However, it was not a question that they could dogmatise upon, as the really bad cases fell to Porro. Still the mortality from Cæsarean section was only about 5 per cent., and he did not think that Porro could show as good a result as that. With some of the details of the operation he did not quite agree, but the question of greatest importance was, whether they should sterilise the woman or not. In woman the strongest desire is to bear children, and it was his strong conviction that a woman should not be sterilised except it is by her own choice. One does not sterilise his patients in doing Cæsarean section.

Dr. A. J. Smith said the point to which he would specially refer was, whether a woman should be sterilised or not in doing Cæsarean section. The only case he knew of was one in which Dr. Macan performed Cæsarean section on a little dwarf, with good results to both mother and child. However, the little creature was frail, both morally and otherwise, and she became pregnant again. They were about to perform Cæsarean section again, but in the middle of the night the muscular wall of the uterus in the line of the old sutures gave way, and the patient died from collapse. He always felt that it would have been a great blessing to her if she had been sterilised. Whether it should be done by Porro's operation, or merely ligature of the tubes and ovaries, he thought that it would be a great benefit to society at large as well as to such people themselves if they had been sterilised.

Dr. More Madden thought that it would add to the advantages of the Academy if their fellow-members throughout the country would give them their experiences oftener. He thought the opera-

tion which Dr. Colahan had done reflected great credit on his surgical skill. He ventured to think, however, that though the operation was so successful, still it might possibly have been as well had he performed the Cæsarean operation—and more especially since the mortality of Porro's operation has been so very high as compared with Cæsarean section. In cases of rachitic pelvis the Cæsarean section has been eminently successful in Scotland, and in the hands of Cameron there have been only about two deaths in twenty operations, while the mortality of Porro's operation has, according to Sir Spencer Wells, been about 56 per cent. Therefore, he thought the Cæsarean section safer for the women in whose interest it should be performed.

Dr. COLAHAN, in reply, stated that it was the first time, as far as he knew, that the operation was performed in the West of Ireland—and, not anticipating such an undertaking, he found himself without a serre-nœud at the last moment, and although the use of them was quite successful, yet he would not for choice use silver sutures for the abdominal incision. In reply to Dr. Smyly, he said he quite agreed that there were many women who would not wish to be sterilised, and who would wish to have children in the future, but he was quite certain that this particular woman did not want to have more children, nor was it desirable that she should. In reply to Dr. Smith, he said he had Dr. Macan's case at the Rotunda in his mind when he alluded to these dwarfs becoming pregnant a second time. Had Dr. Macan performed Porro's operation upon that patient instead of Cæsarean section, she would now be alive. Dr. Colahan was not aware, until Dr. Smith mentioned it now, that in Dr. Macan's case the woman died of rupture of the uterus at the site of the former uterine section. In reply to Dr. More Madden, Dr. Colahan said that, with all respect, he coincided with Mr. Tait's opinion that Porro's operation, if properly done and at the proper time, is a most successful operation, and the mortality a mere bagatelle. Nothing could be more misleading or unfair than the statistics of Porro's operation. Dr. Colahan believed that Porro intended that his operation should be for the purpose of saving the mother and child, and should be done on a sound uterus and a viable fœtus. He further believed that Mr. Godson's classification of Porro's operation should be followed in collecting statistics; in this way the true Porro's operation would not be confounded with operations done for a uterine myomata, or for removing a child from a ruptured uterus where the fatal

result is almost certain. If the true Cæsarean section was mixed up in this way it would soon fall into disrepute. In conclusion, he did not think that it was as yet very intelligible why the tedious processes of suturing the uterus and then sterilising that organ should be preferred to a true Porro's operation.

CLINICAL REPORT OF THE ROTUNDA LYING-IN HOSPITAL, FOR THREE YEARS, FROM NOVEMBER 1, 1889, TO OCTOBER 31, 1892.

By WILLIAM J. SMYLY, M.D.;
Master, Rotunda Lying-in Hospital;

And J. H. GLENN, M.D.;
Assistant Master, Rotunda Lying-in Hospital.

[Read in the Section of Obstetrics, June 23, 1893.]

During the three years comprised in this report 3,602 women were confined in the hospital, of whom 37 died. In considering the death-rate in a lying-in hospital it must be borne in mind that the number of difficult and dangerous cases admitted is abnormally large. The institution must, however, bear the responsibility for all cases of septic infection contracted within its walls, and its merits as an asylum for lying-in women is shown more by a low morbidity than by the actual mortality. It will be seen by the accompanying tables that in both these respects the first year contrasts unfavourably with the other two. In that year 10 women died of some form of blood-poisoning, or about 0·83 per cent., whilst amongst the 2,403 women delivered during the two subsequent years there was not a single death from this cause. I believe that this improvement is in a large measure due to the unremitting vigilance of the lady superintendent and the night superintendent.

When I was appointed to the Mastership of the hospital, in November, 1889, there had not been a death from any kind of blood-poisoning for eighteen months, and I did not, therefore, see any reason for altering the methods employed for the prevention of such diseases. I may briefly mention what these methods were, and I will afterwards state how they have been modified, with the reasons for such modifications.

Any pupils on duty might examine patients abdominally, but only three students and one midwife vaginally. Previous to examination the external genitals were carefully asepticised by washing with soap and water, removing the soap with an irrigator, and bathing with corrosive sublimate solution, 1 in 500. The hands of the examiner were carefully scrubbed with soap and water, and a strong nail-brush then irrigated with carbolic lotion and bathed in corrosive sublimate solution. The internal genitals were douched out only in cases of purulent or fœtid discharge, in cases of pelvic deformity, and where operative interference was required. After delivery a napkin, wrung out of corrosive sublimate solution, was applied to the vulva, but was not renewed. Night and morning each patient was given a basin containing water and a large piece of tenax, and was directed to wash herself. The reason that the patients were directed to wash themselves was to avoid the possibility of the nurse carrying infection from one patient to another. There was one basin to two patients, each basin being kept on a dresser in the ward.

Table of Deliveries (including Abortions) per Month.

Year	Nov.	Dec.	Jan.	Feb.	Mar.	Apr	May	June	July	Aug.	Sep.	Oct.	Total
1889–90 .	96	118	86	85	109	92	119	109	111	106	77	91	1,199
1890–91 .	76	94	106	86	103	110	96	109	116	117	79	92	1,184
1891–92 .	106	97	78	104	93	109	128	113	115	108	76	92	1,219

Dispensary for Outdoor Patients.

Year	Number of Single Attendances	Number of Repeated Attendances	Total
1889–90 .	3,680	5,308	8,988
1890–91 .	3,464	4,300	7,764
1891–92 .	3,521	4,053	7,574

—	1889–90	1890–91	1891–92	Total	Average
Total number of labours	1,199	1,184	1,219	3,602	
Primiparæ	377	343	389	1,109	1 in 3·25
Abortions	29	23	50	107	1 in 33·7
Hyperemesis	—	2	1	3	1 in 1,201
Hydramnios	6	6	5	17	1 in 212
Myxoma chorii	—	—	4	4	1 in 900
Face to pubes	13	7	4	24	1 in 150
Face	3	4	3	10	1 in 360
Brow	1	1	2	4	1 in 900
Breech and lower extremities	41	48	29	118	1 in 30·5
Shoulder and upper extremities	3	1	2	6	1 in 600
Twins	F. 6 M. 3 M. F. 5	F. 6 M. 6 M. F. 5	F. 4 M. 4 M. F. 8	F. 16 M. 13 M. F. 18	1 in 78·3 — M. 1 in 225; F. 1 in 277; M. F. 1 in 200
Triplets	—	—	(males)	Breech; Breech; Vertex	1 in 3,602
Prolapse of funis	2	8	14	24	1 in 150
Placenta prævia	6	5	6	17	1 in 212
Accidental hæmorrhage	11	13	20	44	1 in 81·9
Post-partum do.	23	14	11	48	1 in 75
Secondary do.	3	5	—	8	1 in 450
Prolapse of uterus	1	1	—	2	1 in 1,801
Rupture of do.	—	—	1	1	1 in 3,602
Do. of cervix & vagina	—	2	1	3	1 in 1,201
Lacerations of perinæum	87	49	86	222	1 in 16·7
Adherent placenta	15	10	10	35	1 in 102·9
Occlusion of vulva	—	—	2	2	1 in 1,801
Myoma	1	3	1	5	1 in 720·4
Induction of premature labour	2	2	3	7	1 in 514·6
Version	8	11	6	25	1 in 194
Forceps	47	22	38	107	1 in 33·6
Perforation	2	3	2	7	1 in 514·6
Cephalotripsy	1	—	—	1	1 in 3,602
Cæsarean section (Porro, 1 in 1891)	—	3	—	3	1 in 1,200
Episiotomy	2	1	2	5	1 in 320·4
Eclampsia	5	6	6	17	1 in 212
Insanity — Mania	3	—	2	5	1 in 720·4
Insanity — Melancholia	—	—	1	1	1 in 3,602
Chorea	1	—	—	1	1 in 3,602
Surgical emphysema	—	2	—	2	1 in 1,801
Morbidity	185	117	94	396	1 in 9
Mortality	19	9	8	36	1 in 100
Children born alive	1,051	1,067	1,172	3,290	1 in 1·095
Do. died in hospital	40	27	44	111	1 in 32·45
Spina bifida	3	—	1	4	1 in 900
Anencephalus	—	1	3	4	1 in 900
Hydrocephalus	—	1	—	1	1 in 3,602
Meningocele	—	1	1	2	1 in 1,801
Cephalhæmatoma	2	1	—	3	1 in 1,200

	1889-90	1890-91	1891-92
Cases	1,729	1,892	1,896
Abortion	185	208	214
Do. Threatened	10	9	17
Anencephalous fœtus	1	—	—
Accidental hæmorrhage	2	9	12
Adherent placenta	20	19	30
Breech	45	61	35
Brow	4	—	2
Cæsarean section on dead mother	—	—	1
Cleft palate	3	1	—
Curetting for abortion	2	32	28
Cyst of liver	1	—	—
Eclampsia	—	2	—
Elephantiasis of labia	—	—	1
Face	5	4	3
Footling	9	5	12
Forceps	24	20	28
Hare-lip	4	1	—
Hydramnios	10	19	6
Hydrocephalus	2	1	—
Hæmatoma vulvæ	—	—	1
Imperforate anus	1	—	—
Intra-uterine amputation of R. forearm	1	—	—
Laceration of cervix	6	1	1
Do. perinæum	72	50	55
Lipoma of abdominal wall	1	—	—
Mania	—	1	—
Occipito-posterior	16	9	19
Placenta prævia	15	8	7
Porro	—	1	—
Post partum hæmorrhage	31	21	44
Do. do. Secondary	1	2	—
Prolapse of cord	11	12	5
Do. of both hands	—	1	—
Do. of both cords (twins)	—	1	—
Do. of hand and vertex	4	4	10
Do. of hand and foot	1	—	—
Do. of both hands and vertex	1	1	1
Retained membranes	8	10	16
Rupture of posterior cul de sac	—	1	—
Ruptured tubal preg.	—	—	1
Shoulder	1	—	2
Spina bifida	1	2	1
Talipes Eq. Var.	1	—	1
Do. Calcaneus	1	—	—
Transverse	5	1	2
Triplets { Male, alive, vertex; Female, dead, breech; Male, alive, breech } 1 placenta	—	—	1
Twins	25	26	22
Males	6	6	7
Females	8	5	8
Male and female	11	13	7
Vertex	9	8	4
Breech	2	2	—
Vertex and Breech	8	9	8
Version Ext.	5	1	1
Do. Int.	6	7	4
Vesicular mole	1	—	1

Table showing Cause of Deaths in the Rotunda Lying-in-Hospital from November 1, 1889, *to October* 31, 1892.

1889–1890.

Name	Admitted	Delivered	Died.	Cause of Death.
1. C. R.	Nov. 30	Nov. 30	Dec. 1	Eclampsia
2. S. C.	Dec. 8	Dec. 8	Dec. 8	Accidental hæmorrhage
3. M. C.	„ 19	„ 19	„ 19	Accidental hæmorrhage
4. T. H.	„ 28	„ 28	„ 28	Phthisis
5. T. K.	„ 27	Jan. 5	Jan. 10	Septicæmia
6. J. D.	Jan. 14	„ 14	„ 15	Eclampsia
7. S. H.	April 8	April 13	April 14	Meningitis
8. M. B.	April 28	April 30	May 1	Eclampsia
9. L. T.	May 6	May 7	„ 28	Pyæmia
10. A. F.	June 10	June 11	June 22	Septicæmia
11. E. C.	„ 20	„ 22	„ 25	Phthisis
12. A. B.	„ 18	„ 19	July 25	Septicæmia
13. S. P.	Aug. 16	Aug. 23	Sept. 5	Do. and myoma
14. M. B.	„ 15	„ 17	Aug. 29	Do.
15. M. L.	„ 18	„ 20	Sept. 25	Pyæmia
16. E. M.	„ 2	„ 2	Aug. 27	Do.
17. M. F.	Oct. 6	Oct. 7	Oct. 12	Septicæmia
18. B. M.	„ 15	„ 15	Dec. 22	Pyæmia
19. C. O'N.	„ 24	„ 29	Oct. 29	Intestinal obstruction

1890–1891.

1. M. M'G.	Jan. 4	Jan. 4	Jan. 9	Phthisis
2. M. R.	„ 10	„ 10	„ 18	Pneumonia
3. J. L.	Feb. 1	Feb. 1	Feb. 1	Accidental hæmorrhage
4. C. M.	March 2	March 2	March 2	Do.
5. E. C.	May 5	May 5	May 6	Epilepsy
6. M. F.	Aug. 4	Aug. 5	Aug. 6	Hyperemesis
7. M. B.	„ 6	„ 6	„ 6	Hæmorrhage—Rupture of uterus
8. B. B.	„ 5	„ 6	„ 9	Pneumonia
9. C. K.	Oct. 2	Oct. 3	Oct. 3	Rupture of uterus

1891–1892.

1. A. P.	Nov. 3	Nov. 4	Nov. 4	Eclampsia
2. M. D.	„ 18	„ 20	„ 29	Mania
3. B. C.	April 8	April 9	April 9	Mitral disease. Œdema of the lungs
4. M. M.	„ 14	„ 14	„ 15	Empyema
5. C. A.	June 14	June 14	June 15	Eclampsia
6. A. C.	„ 23	„ 24	„ 26 (at home)	Double pneumonia
7. M. R.	„ 29	„ 30	„ 30	Rupture of cervix and vagina—Porro
8. M. B.	July 6	July 6	July 7	Pneumonia
9. M. B.	Oct. 27	Oct. 27	Oct. 28	Eclampsia

Table of Morbidity, 1889–92, *showing number of cases over* 100·4°.

Temperature	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	—
100·4°, but not exceeding 102·2°	7	4	6	6	11	8	19	16	8	11	4	7	1889–90
	4	2	8	6	8	8	6	12	12	5	10	8	1890–91
	7	5	1	2	6	9	9	7	4	4	5	1	1891–92
102·2°, but not exceeding 104°	3	7	4	2	4	4	5	7	8	6	1	1	
	2	3	2	2	4	4	1	1	2	3	2	2	Do.
	3	3	1	4	–	7	5	1	2	2	1	–	
104°, but not exceeding 105·8°	–	2	1	1	3	1	5	5	–	6	–	2	
	–	1	–	–	–	–	–	–	–	2	1	1	Do.
	–	–	–	–	1	1	–	–	–	1	–	1	
105·8°, but not exceeding 107·6°	–	1	–	–	–	–	–	–	–	–	–	–	
	–	–	–	–	–	–	–	–	–	–	–	–	Do.
	–	–	–	–	–	–	–	–	–		–	–	

Case, November, 1892, reached 109·4°.

Table showing months of greatest Morbidity, 1889–92.

Month	1889-90	1890-91	1891-92	Total
November .	10	6	11	27
December .	14	6	8	28
January .	11	10	2	23
February .	9	8	6	23
March . .	18	12	7	37
April . .	13	12	17	42
May . .	29	7	14	50
June . .	28	13	8	49
July . .	16	14	6	36
August . .	23	10	7	40
September .	5	13	6	24
October . .	10	11	2	23

SEPTIC INFECTION.

The first death from septic infection occurred in January, 1890. (No. V.)

Case I.—T. K. came up from the country to have labour induced on account of pelvic deformity. It was found very difficult to excite uterine action. A gum elastic bougie was introduced between the membranes and the wall of the uterus, removed after 12 hours and another passed in a different direction. This was repeated several times at intervals of 12 hours, and hot douches were frequently employed. When the os was as large as a shilling, the membranes were ruptured and a Barnes' bag inserted. She was finally delivered naturally. Acute lymphatic septicæmia supervened upon the second day, and she died on the fifth.

During this month there were 10 other cases in which the temperature exceeded 100·4° F. In February there were 85

deliveries and 9 morbid cases. In March 109, with 18 morbid cases, 12 of which occurred during the first fortnight. Regarding as I do the morbidity of the patients as the true test of the efficiency of the measures taken to secure their safety, I became alarmed at this increasing number of high temperatures, feeling sure that where there is morbidity mortality is a probable accident, resulting from the virulence of the poison and the condition of the organism into which it is introduced, circumstances over which we have very little control. I forbade vaginal examinations excepting in particular cases, when they were made by myself or one of my assistants. In April vaginal examinations were resumed; there were 13 morbid cases amongst 92 patients. In May there were 119 deliveries, 29 morbid cases, and 1 death.

Case II.—L. T., aged twenty-three; primipara; admitted May 6, 1890, and was delivered naturally on the 7th.

Patient's temperature and pulse were perfectly normal till the evening of the 10th, three days after delivery, when they rose to 105·2° and 132. Her face was flushed, the alæ nasi working, and she complained of severe headache. The uterus was washed out, and an iodoform pessary, 30 grs., was introduced. Next day her morning temperature was 103°, with pulse 113, and in the evening 104·2° and 110. She had a rigor. Uterus was douched with plain water.

On the 12th, in the evening, the temperature was 103·4°, and pulse 118, intermittent; suffering from psychosis and diarrhœa. On the 14th the evening temperature reached 105·3°, with pulse 126. The temperature continued to be high, reaching 105·8° on the evening of the 18th, when redness was observed on both elbows and ankles, and the next day effusion was diagnosticated. She was transferred to the Auxiliary Hospital on the 21st, her evening temperature being 105°, and pulse 152—double bronchitis now being present, with respiration 46. She was receiving half an ounce of whisky every hour, but became worse, and died at 5 30 a.m. on the 23rd. (No. 9.)

I found by the bed cards that one of the pupils who

had examined this case had the same day examined two other patients, both of whom became dangerously ill, though they ultimately recovered. I prohibited his attending the hospital for a month, and again stopped vaginal examinations. When they were resumed one student only was allowed to examine each case, the object being to increase the sense of individual responsibility. During June 109 women were delivered—28 had abnormal temperatures, two of whom died. (Nos. 10 and 12.)

Case III.—A. F., age twenty; primipara; was admitted June 10, 1890, and was delivered naturally on the 11th. The evening temperature on the 13th was 102°, and pulse 120. The discharge was not fœtid, but she complained of headache. On the 14th the morning temperature was 101° and pulse 112, with tenderness over uterus and fœtid lochia. The uterus was washed out with plain water. Dry rhonchi heard over both lungs on the 15th. For the next five days the temperature remained high, between 101° and 103°, and pulse 102 to 120. She died on the eleventh day after delivery.

Case IV.—A. B, age twenty-three; primipara; was admitted June 18, 1890, and had a normal labour on the 19th. The evening of June 22 her temperature went up to 102° and her pulse to 104. Her uterus was washed out. This patient was not examined before delivery. The washing out brought her temperature down temporarily, but on the 25th it reached 103°, with a pulse of 130. The uterus was again washed out with carbolic solution, 1 in 80. Next day the temperature was rather better, 102·2°, and pulse 112. Uterus was washed out with plain water. The patient was transferred to the Auxiliary on the 28th, and though her evening temperature never reached normal, yet it was never seriously high, taking the pulse into account, until the morning of July 3, fourteen days after delivery, when it touched 103°, and pulse 102. Next day a laceration of the cervix on the left side with parametritis sinistra was diagnosticated. She got gradually worse and worse, evening temperature several times being 105°, and the pulse, an especially bad feature in her case, got higher every day, reaching 168. She died July 25, thirty-seven days after delivery.

Up to this time plain water had been used for douching, but I have, since July of this year, always employed some antiseptic—creolin, iodine, carbolic acid, or corrosive sublimate. In July there were 16 morbid cases.

In August there were 23 morbid cases and 4 deaths (13, 14, 15, 16).

Case V.—S. P., age twenty-eight, delivered August 23rd, 1890; primipara. Was not examined vaginally. On the evening of the third day after labour, which was normal, the temperature rose to 100·4° with chill and headache. Next day's morning temperature was 102°, and pulse 120, with tenderness over the left broad ligament; the vagina was douched, and a compress applied over the hypogastrium. In the evening the temperature was 103°, pulse, 132; uterus was washed out with corrosive sublimate solution. This was followed by no marked benefit, as on the 27th the temperature in the evening was 103°, pulse, 126. On the 28th diarrhœa set in, the tongue was dry down the centre. Next day, 29th, there was parametritis on both sides. For four days she improved, the temperature merely reaching 101°, but pulse still quick, until September 3rd, when green vomiting with diarrhœa set in, and the temperature rose to 103·6°, with pulse 144. On the 4th this continued, and she died on the 5th (thirteenth day). There was a large sloughing myoma.

Case VI.—M. B., age forty; primipara; admitted August 15th. Normal labour. Child expressed by Dr. Bagot, August 17. Temperature was all right for five days. On the evening of the 22nd, it rose to 102·4°; pulse, 117; with shivering and tenderness over the left cornu of uterus. 23rd, uterus was douched out with 1 in 5,000 corrosive sublimate solution; this was followed by slight improvement, but on the 25th went to 103·2° and 104°; pulse, 112. She was again washed out with 1 in 6,000. The catheter had to be regularly passed, the quantity of urine was satisfactory. No marked improvement followed, and she died on the 29th, twelve days after delivery.

Case VII.—M. L., age eighteen; primipara; admitted August 18, 1890. Had a perfectly normal labour on the 20th. On the evening of the 23rd her temperature suddenly rose to 104·4°;

pulse, 114; and she complained of shivering headache and sleeping badly; the lochia were normal apparently. The uterus was washed out with plain water, and her temperature and pulse fell next morning to 98·4° and 84; this continued till the 27th, when patient signed the declaration and went home. That evening patient had a rigor, and when seen by the extern assistant an hour after, her temperature was 106·2°, and her pulse 180. She was treated at her own home for four days and then sent in to the Auxiliary, having had rigors on the 31st and September 1st.

Her further history was—high temperature up to 105°, and pulse 150, with rigors on the 13th, 14th, 15th, and 24th; diarrhœa set in on the 18th, and cough, with consequent insomnia; on the 24th at 9 p.m. her temperature rose to 105·6°, and she died at 3 30 p.m. on the 25th, five weeks after delivery.

Case VIII.—E. M., age twenty-eight; second pregnancy; admitted August 2, 1890. Was not examined by anybody, neither was the vulva touched during delivery. On the morning of the 5th, three days after delivery, the temperature was 99°; pulse, 100; and in the evening, 102°; pulse, 118; the lochia normal, breasts greatly distended and tense. Uterus was washed out with plain water. Next day, fourth after delivery, the evening temperature reached 105°, and pulse 120. The uterus was washed out, and was followed by a profuse red discharge. Tinct. iodi. was injected by Braun's syringe, and the uterus, which was very badly contracted, was plugged with iodoform gauze; this was removed twenty-four hours later, and the same treatment again employed; temperature, 104°; pulse, 126. On the 8th the morning temperature was 103°, the evening 102°; the pulse being 132 and 120 respectively; the plug was not renewed, but uterus was douched with plain water. From this on the temperature at night varied between 100° and 103°, the pulse likewise seldom under 120 and often up to 140. Died on the 27th, twenty-five days after labour.

After the middle of this month I again stopped vaginal examinations, but without apparent benefit, as three of the fatal cases had never been examined. In all these cases infection was late, and they were of the phlebothrombotic type. It appeared, therefore, probable that the infection was due to some error in the management subsequent to rather

than during labour. Each patient was now provided with a separate basin, which was kept over her bed, and carefully scrubbed and disinfected with corrosive sublimate both before and after using it. I also directed that they should be washed by the pupil midwives, both because this is an important part of a nurse's education, and also because an ignorant woman, lying in bed, could not thoroughly cleanse her own hands, and there was, therefore, considerable risk of her infecting herself.

In September there were only five cases in which the temperature exceeded 100·4° F. In October there were ten morbid cases, two of which died. (No. 17 and 18.)

Case IX.—M. F., age twenty-seven; first pregnancy; admitted October 6, 1890. Delivered by forceps, October 7. Temperature and pulse rose thirty-six hours later, and she ran the usual course. Perinæum and part of left labium sloughed on the 10th. Iodoform pessary introduced into vagina. October 12th. tubular breathing. Died at 11 p.m.

Case X.—B. M., age twenty-eight; admitted October 15, 1890; primipara. Was not examined and was normally delivered the same day. On the evening of the next day, 16th, twenty-four and a half hours after labour, her temperature was 101·4°, with pulse 102, but no complaint. Next morning temperature was 99·8°, and pulse 112, and headache; the vagina was douched, as discharge was fœtid. The evening temperature was 102·6°; pulse, 120; so uterus was washed out with plain water. On the 18th this was repeated, as temperature continued high, and a piece of decomposing membranes was washed out; carbolised water being employed. For the next three days little improvement showed itself and on the 21st diarrhœa set in and lasted until the 26th, but without reducing the temperature; the pulse also was 128 to 132, and got higher, going to 156. Patient was now (27th) transferred to the Auxiliary, and, after a long struggle, died two months and a week after her delivery (Dec. 22).

PROLAPSE OF FUNIS.

During the years 1889–1892 there were 21 cases, with 25 children, 8 of whom died.

Name	Treatment	Result to Child	Presentation	Remarks
1. M. W.	1st. Foot brought down and child extracted. 2nd. Podalic version and extraction	1st dead. 2nd alive	B. & V.	Twins; 1st breech cord prolapsed two feet; no pulsation; post partum hæmorrhage.
2. H. C.	Replaced in genu-pectoral position	Alive	V.	Forceps
3. B. B.	Left to nature	Macerated	Footling	Premature; 7½ months: fœtus macerated
4. K. B.	Bi-polar version	Dead	V.	—
5. M K., Aug. 5	Extraction by foot	Alive	Footling	—
6. L. D., Sept 4	Forceps	Dead	V.	—
7. J. L.	Do.	Alive	V.	—
8. M. D.	Left to nature	Macerated	V.	Premature; bones of skull freely movable
9. E. O'R.	Do.	Dead	Footling	Premature; 6 months; accidental hæmorrhage
10. A. N.	Do.	Do.	V. & hand	—
11. M. L.	Do.	1st alive. 2nd dead	V. B.	Twins; vertex breech
12. N. W.	Extraction	1st alive. 2nd alive	F. F.	Twins; both footling; lived but a short time
13. M. H.	Reposition by hand	Dead	Arm	Prolapse of arm and funis
14. M. A. D.	Left to nature	Do.	V.	No pulsation on admission
15. A. M.	Do.	Do.	V.	Premature; 6½ months
16. M. A. N.	Reposition by hand	Alive	V.	—
17. A. L.	Do.	1st alive. 2nd alive	V. B.	Twins
18. L. V.	Left to nature	Alive	B.	Atresia hymenalis present, and broken down
19. M. C.	Do.	Do.	B.	—
20. J L.	Forceps	Do.	V.	—
21. M. R.	Do.	Do.	V.	—

PLACENTA PRÆVIA.

There were seventeen cases of placenta prævia. Eleven children were dead, and one mother was lost through rupture of the uterus. The following are the most interesting cases:—

Case I.—C. M., age thirty-five; seventh pregnancy; was admitted to the Rotunda on August 12, 1891, with considerable hæmorrhage. On palpation the first vertex position with the head not fixed was diagnosticated. This was confirmed by vaginal examination, and at the same time a marginal placenta prævia felt. External version was performed, and a foot brought down. Hæmorrhage continuing, and the os being fairly dilated, the child was extracted. This was a female alive, and weighed six and a half pounds. The patient went on well, and was discharged Aug. 21.

Case II.—M. F., age twenty-seven; second pregnancy; was admitted to the hospital August 6, 1891, with hæmorrhage. Marginal placenta prævia was diagnosticated, and an attempt at internal version made and abandoned in favour of the forceps, as the lower uterine segment was greatly thinned out. The extraction proved comparatively easy, and the child, a male, weighing eight pounds, was delivered occipito-posterior. The placenta was strongly adherent, and was removed with the utmost difficulty. Owing to the great flaccidity and softness of the uterus a rupture through the upper portion of Douglas's pouch occurred, and the patient died on the couch.

Case III.—M. W., age thirty-four; ninth pregnancy; was sent in January 19, 1890, from the extern maternity, suffering from ante-partum hæmorrhage. The membranes had been ruptured before admission. On examination the placenta was palpated low down in front; the os admitted two fingers; the head and a foot were presenting; and a marginal placenta prævia was felt. Combined version was performed, a foot brought down, and the case left to nature. The child was dead. Patient was discharged January 29.

Case IV.—R. M., age thirty-four; sixth pregnancy; was admitted December 3, 1889, with hæmorrhage, which began at 8 15 a.m. Placenta prævia was diagnosticated, and the membranes were

ruptured at 10 p.m., and all bleeding ceased for seven hours, but returned at 5 a.m., Dec. 4. Hot-water douching controlled it, and patient was delivered December 5, at 5 50 p.m., of a premature child. The placenta was adherent, and was removed by hand. Post-partum hæmorrhage came on, but was stopped by hot-water douching. Patient went home December 18.

Case V.—S. V., age 30; seventh pregnancy; was admitted into the Rotunda for hæmorrhage, December 4, 1889. Palpation indicated a breech, which was confirmed by vaginal touch. The os was the size of a shilling, and placenta was felt. At two next morning considerable hœmorrhage came on, and the membranes were ruptured and stopped it. The patient went on for three days without further advance or bleeding till the 8th, when a foot was brought down, and she delivered herself of a dead male infant, weighing four and a half pounds. The placenta was firmly adherent, and was manually separated. Patient left in good health December 17.

Case VI.—M. J., age twenty-seven; third pregnancy; was admitted into hospital from the extern maternity, November 22, 1889, having been plugged by the clinical clerk for ante-partum hæmorrhage. On admission the placenta was palpated low down the os was one-third dilated, and a partial placenta prævia could be felt; the head was high up, freely movable, and in the second position. Fœtal heart was slow, with a well-marked limit. The membranes were ruptured, and a hot-water douche given; the placenta lay posteriorly and to the left. Ergot was administered at twelve midday; at four p.m. hæmorrhage returned, the os was half dilated, and the head still freely movable; the fœtal heart could no longer be heard; forceps were used, and the child easily delivered, but was dead. Patient discharged the eighth day.

Case VII.—M. R., age thirty-eight; thirteenth pregnancy; admitted for placenta prævia, December 29, 1891. On examination hydramnios was likewise diagnosticated, and she delivered herself of an anencephalous dead fœtus. Went home January 6, 1892.

Case VIII.—J. M., age thirty-two; fifth pregnancy; admitted to the Rotunda Hospital, April 21, 1892, for hæmorrhage. Placenta prævia partialis was diagnosticated, and hæmorrhage continuing a foot was brought down. Pains now completely ceased, and for seventeen hours none came on, and patient then delivered herself of a seven months dead fœtus. Went home January 27.

1889–1890.

Name	Variety	Result to child	Presentation	Result to Mother	Remarks
M. J.	Partial	Dead -	V. 2	R.	Forceps
S. V.	Do.	Do. -	V. 1	R.	Version
R. M.	Do.	Alive -	V. 1	R.	Adherent placenta
E. K.	Do.	Do. -	B.	R.	Version
M. W.	Marginal	Dead -	V. and foot	R.	Do.
M. F.	Partial	Do. -	V. 1	R.	Do.
		1890–1891.			
A. B.	Lateral	Dead -	V. 1	R.	Version
E. P.	Partial	Do. -	Hand	R.	Do.
M. F.	Marginal	Alive -	V. 1	D.	Forceps ; rupture of uterus
E. R.	Partial	Dead -	V. 1	R.	Version
C. M.	Marginal	Alive -	V. 1	R.	Do.
		1891–1892.			
M. R.	Partial	Dead -	V. 1	R.	—
M. H.	Marginal	Do. -	Arm	R.	—
J. M.	Partial	Do. -	V. 1	R.	Version
M. D.	Marginal	Alive -	V. 1	R.	—
H. R.	Partial	Dead -	V. 1	R.	Version
E. R.	Do.	Alive -	B. V.	R.	Twins

ACCIDENTAL HÆMORRHAGE.

There were forty-four cases of accidental hæmorrhage, most of them of little consequence, but some very dangerous and five fatal.

The accouchement forcé did not yield satisfactory results. These patients appeared to suffer from an extreme degree of shock, and the rapid emptying of the uterus in those cases in which it was employed seemed to determine the fatal issue. The treatment of such cases has never been satisfactorily formulated, but the general line of treatment which we now adopt is as follows:—When labour pains are absent, wash out the vagina with hot antiseptic solution, 110° F., plug the vagina and apply a binder. When labour pains set in rupture the membranes and bring down a foot, or, where practicable, deliver by forceps or perforator. There are cases, however, which do not admit of any delay, and yet the os is not sufficiently dilated to deliver immediately per vias naturales; in such cases Porro's operation is the only method which holds out a hope of saving the mother's life. A case of this kind occurred in the extern maternity during my absence in 1891. Dr. Bagot, my senior assistant, performed this operation at the patient's home with a satisfactory result.

Case I.—S. C., admitted in a very collapsed condition from excessive loss of blood, the os being fairly dilated and the head presenting, the latter was perforated and the child extracted. The patient died on the couch.

Case II.—M. G., age thirty-two, 5-para, was admitted December 19, 1889, in a collapsed condition, her pulse could no longer be felt, and she was completely blanched. On examination the os was found to be half dilated. Podalic version was performed and the child extracted. Immediately severe post-partum hæmorrhage followed; the uterus was injected with liq. ferri. perchlor., part 1 in 4, and the usual restoratives employed, however, without avail, as she died three and a half hours after delivery; the child was a male, dead, weighing eight pounds.

Case III.—N. S., age thirty-five, 6-para, was admitted with severe hæmorrhage, July 21, 1890. Membranes were ruptured and a foot brought down, this acting as a plug the case was left to nature, and she delivered herself of a dead male fœtus.

Case IV.—A. D., age thirty, 7-para, was admitted into hospital, May 28, 1890, with severe hæmorrhage. Membranes were ruptured, but the hæmorrhage continuing, bi-polar version was performed, and a foot was brought down. This acting as a plug, controlled the bleeding, and the patient later on delivered herself of a dead female, weighing 6½ lbs. Patient went out well.

Case V.—K. M., age thirty-four, 8-para, admitted March 2, 1891, with hæmorrhage; breech presentation. Membranes ruptured, and leg brought down. Child was delivered by traction, and severe post-partum hæmorrhage followed, which was treated by hot water injections and swabbing out the uterus with liq. ferri. perchlor. The patient died three hours after delivery. The child was a male, dead, weighing four pounds.

Case VI.—J. L., age thirty, 7-para, was admitted to the Lying-in Hospital, February 1, 1891, at 10 30 a.m. On palpation the uterus was found to be very tense; patient was very pale, with a small pulse of 120. The vaginal examination showed a first vertex position with an os the size of half-a-crown and very dilatable. Internal version was performed at 2 45 p.m., and immediate extraction of a dead male infant; the placenta was found completely separated; auto-transfusion employed, after which the patient rallied for a little; morphia in one-third grain dose was administered owing to her great restlessness, and repeated two hours later. At 8 15 transfusion, according to the method of Münchmeir, was performed, but without success, as she died at 9 30 p.m.

Case VII.—M. B., age twenty-five, 3-para, admitted November 18, 1891, with symptoms of concealed accidental hæmorrhage. On pushing up the head this was followed by a gush of hæmorrhage. Internal version was performed, and child extracted; male, dead, weighing 7¾ lbs. Rupture of posterior vaginal wall high up was now diagnosticated, and plugged with iodoform gauze; this was removed thirty-six hours after, and no bleeding followed. On the 27th the patient was deeply jaundiced, and her urine was examined for uro-bilin, but with a negative result. This disappeared in two days, and from this on she made an uninterrupted recovery; her highest temperature was 99·8°.

Case VIII.—M. D., age thirty-six, 10-para, was admitted December 9, 1891, with accidental hæmorrhage. Internal version

was performed, and a foot brought down; hæmorrhage continuing slow extraction was employed, and the child delivered, Schultzed for an hour and resuscitated. The patient went home on the eighth day.

CASE IX.—E. M'D., age thirty-eight, 12-para. Very anæmic, the membranes intact, and the os the size of a shilling. A hot douche was given, and the vagina plugged with iodoform gauze; a firm binder being also applied; strong pains set in almost immediately, and the child, which was a male, dead, was expelled by natural efforts; the placenta following in the same pain.

PORRO'S OPERATION.

In this case my assistant, Dr. Bagot, was called to a patient in the extern maternity. In a tenement house, not far from the hospital, he found a poor woman almost collapsed from severe accidental hæmorrhage, which had been at first concealed. The pulse was 148, very small and compressible; her lips were quite blanched, and her pupils dilated. There was jactitation and sighing respiration. The uterus was larger than the term of pregnancy, though the membranes had been ruptured before his arrival, in order to check the bleeding. The child presented in the first position, vertex; no fœtal heart could be heard. The os, which was rigid and undilatable, admitted one finger only. On pushing up the head the blood flowed freely out of the uterus. Labour had not set in, though she had all night suffered from severe distension and pains in the uterus. Believing that, owing to her collapsed state, it would be impossible to deliver her alive by perforation, followed either by version or extraction with the cranioclast, he at once performed Porro's operation, treating the pedicle extra peritoneally by means of a serre-noeud, and pedicle pins made out of two Peaslee's perineum needles, as he had no time to procure proper pins. The placenta was found at the operation to be completely detached, and the uterus was full of clots; the child of course was

dead. She was removed to the Rotunda Hospital on the fourth day after the operation, and made an excellent recovery. Great credit is due to Dr. Bagot for his pluck and promptness in performing an operation under such disadvantageous circumstances.

POST-PARTUM HÆMORRHAGE.

There were forty-eight cases of post-partum hæmorrhage, very few being of a dangerous amount. Perchloride of iron was used in four cases only, and all were in the first year. Since then we have found plugging the uterus with iodoform gauze an efficient substitute. Five patients died, but they were all cases which had been rapidly delivered on account of severe ante-partum hæmorrhage, and have been fully detailed amongst the cases of accidental and unavoidable hæmorrhage.

Transfusion of salt and water was employed in two cases, once hypodermically by Münchmeir's method, and once intravenous by means of Collins' apparatus, but in both cases with only temporary benefit.

RUPTURE OF UTERUS AND CERVIX.

Excluding cases of vertical tears of the cervix, there were three cases of extensive laceration of the vaginal vault, and one of the lower segment of the uterus. Two of these cases have already been detailed under accidental hæmorrhage.

Rupture of Vaginal Vault—Porro's Operation.

M. R., aged thirty-five, 8-para, June 28th, came into the Lying-in Hospital with rupture of the uterus, extending into the posterior fornix of the vagina. The fœtus had entirely escaped from the uterus, which on abdominal palpation could be felt firmly contracted in the left iliac fossa. At first I mistook it for the fœtal head, but this was subsequently discovered in the vagina. The child having been extracted with forceps, a quantity of blood and clots came away. Following up the funis, my hand passed through the

rent, which was, of course, at least as large as the circumference of the fœtal body which had passed through it; having removed the placenta from amongst the intestines, and washed out the abdomen with hot water, hæmorrhage continuing to an alarming extent, I opened the abdomen, and, the control of the bleeding by the most rapid method being a vital necessity, I applied an elastic ligature around the cervix, and removed the uterus. Having secured all the other vessels not included in the ligature, I sewed up the rent in the posterior fornix as well as I could, washed out the abdomen, and drained per vaginam. The patient collapsed.

Rupture of Uterus.

The patient was a married woman, aged twenty-seven, and this was her fourth pregnancy. For some time she had suffered from complete prolapse of the uterus. She was admitted to the hospital on October 1, 1892, and I saw her shortly before midnight. The abdomen was pendulous; the head could be easily felt, freely movable above the pelvic brim, and presenting in the second position. The fœtal heart was strong and regular, and labour had not commenced. The cervix protruded about an inch beyond the vulva. Labour commenced about 1 a.m., but pains were weak and inefficient; at 7 they ceased altogether. She became faint, cold, collapsed, with dark rings around her eyes, and cold sweat on her brow. Pulse 140, weak, and compressible. The contraction ring was at the umbilicus; no fœtal heart heard; cervix inside vulva; os half dilated; no blood escaping externally; no recession of presenting part. The head was immediately perforated, and the child extracted with the cranioclast. Profuse flooding followed the diminution of the head and extraction of the body. The patient died about two minutes after delivery. Upon introducing the hand, a large rent was discovered in the lower uterine segment on the left side, through which the hand could be easily passed into the peritoneal cavity.

The specimen removed from the body showed some points of interest. The lower uterine segment was much thinned out and elongated to the extent of about four inches. From the position of the os internum, estimated by the character of the mucous membrane and reflection of the peritoneum, the cervix did not appear to participate to any great extent in this elongation. This thinning out of the lower uterine segment could hardly have resulted from uterine contraction, because the woman was barely

five hours in labour, and that altogether in the first stage, nor were the pains of even average severity. I am rather inclined to think that it was the result of the long standing prolapse, and I should not be surprised if it be discovered that in cases of so-called supra-vaginal hypertrophy of the cervix accompanying prolapse, the lower uterine segment be found frequently to participate.

FORCEPS.

There were forty-seven forceps cases during 1889-90.

Thirty-three	... ...	Primiparæ.
One	... ...	Secundipara.
Four	... ...	3-paræ.
Four	... ...	4-paræ.
Two	... ...	6-paræ.
Two	... ...	8-paræ.
One	... ...	9-para.

No.		Indications
Thirty-three	for	Delay, *i.e.*, over five hours in the second stage.
Three	,,	Rise in fœtal heart.
Two	,,	Rise of temperature.
Two	,,	Face presentation.
One	,,	Placenta prævia.
One	,,	Eclampsia.
One	,,	Phthisis } dying.
One	,,	Pneumonia }
One	,,	Large myoma obstructing delivery.
One	,,	Prolapse of cord.
One	,,	After-coming head.

The forceps was applied to the breech once. One case required subsequent craniotomy.

There were thirty-three primiparæ.

Ages of Primiparæ.

Fourteen	between	17 and 25	years	of age.
Twelve	,,	25 ,, 30	,,	
Three	,,	30 ,, 35	,,	
Four	,,	35 ,, 44	,,	

There were thirteen children dead.

There were twenty-two forceps cases during 1890–91.

Eleven	...	...	Primiparæ.
Four	...	...	Secundiparæ.
One	...	...	5-para.
One	...	...	6-para.
Two	...	...	7-paræ.
One	...	...	8-para.
Two	...	...	12-paræ.

No.	Indications	Result to child	
		Alive	Dead
3	On account of fœtal heart	3	–
12	„ delay	9	3
1	„ eclampsia	1	–
2	„ accidental hæmorrhage ...	2	–
1	„ ascites of fœtus obstructing delivery	–	1
1	„ placenta prævia ...	–	1
1	„ prolapse of cord ...	–	1
1	On after-coming head	–	1
22		15	7

There was one occipito-posterior.

Ages of Primiparæ.

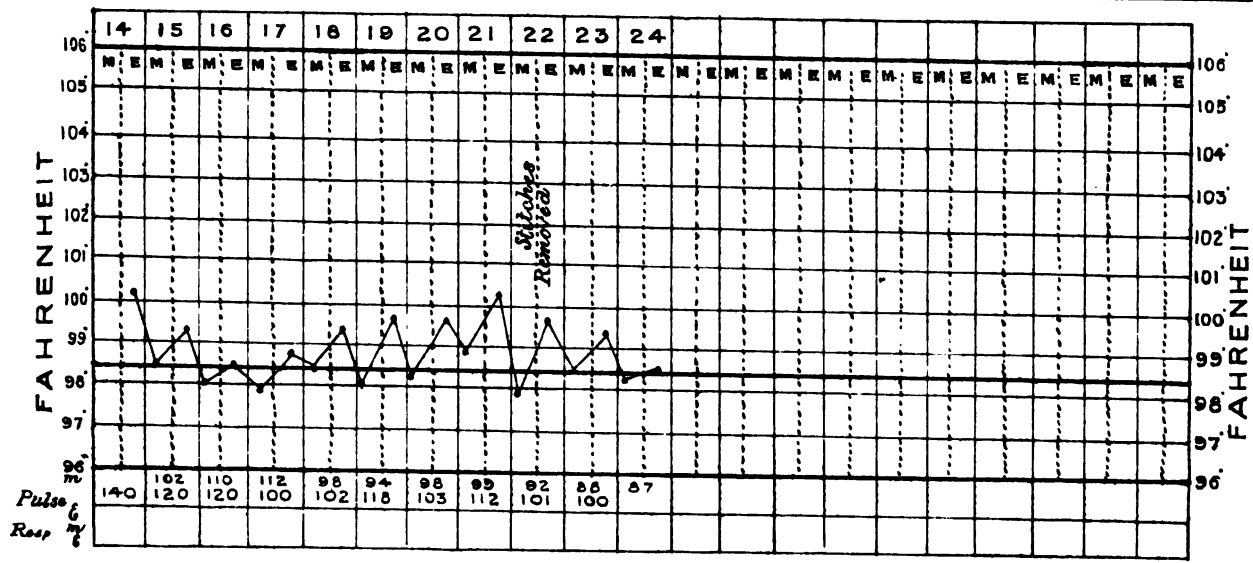
Five between 19 and 25 years of age.
Four „ 25 „ 30 „
Two „ 30 „ 36 „

In the year 1891–92 there were thirty-eight forceps cases.

Twenty-eight	...	...	Primiparæ.
Four	...	...	Secundiparæ.
Three	...	...	3-paræ.
Three	..	...	4-paræ.

No.	Indications	Result to child	
		Alive	Dead
35	Second stage over four hours	27	8
2	Prolapse of cord ...	2	–
1	Eclampsia	–	1
38		29	9

F.H. Age. 29. Cæsarean Section June 14.1891



Recovery

There were six occipito-posterior. Two required subsequent craniotomy.

Ages of Primiparæ.

Seventeen	between	18	and	25	years of age.
Eight	„	25	„	30	„
Three	„	30	„	35	„

PERFORATION.

Five children were perforated:—

Once in accidental hæmorrhage.
Once in brow presentation.
Once in after-coming head.
Once in contracted pelvis.
Once in rupture of uterus.

All the children were believed to be dead.

CÆSAREAN SECTION.

Cæsarean section was necessary in three cases of extreme pelvic deformity—one had a kyphotic, one a rickety flat pelvis, and one a generally contracted flat pelvis. In the first the elastic ligature could not be applied, owing to the head having entered the pelvis. In the second it was applied, but was not lightened until after the extraction of the child, but in the third it was firmly applied, and this child was lost—I believe, in consequence; the other two children survived, and all the mothers.

Case I.—Mrs. H. was brought to me by Dr. Alfred Smith in the third month of her second pregnancy; her first child had been delivered after perforation in the hospital.

Her height was 4 feet 7 inches, and there was a well-marked kyphosis in the lower lumbar and upper sacral regions. The distance between the anterior superior spines of the ilia was 25 cm. and the most distant points of the crests 28 cm. The symphysis pubis protruded in a beak. The sacral promontory could not be reached, but the pelvic outlet was narrowed in all its diameters, especially the transverse, the distance between the tuberosities of the ischia being only 5 cm., or exactly two inches.

The woman was most anxious to have a living child, and after consultation with Dr. Smith and Dr. Bagot, we determined to advise Cæsarean section at term, to which she readily assented. She came into the hospital on Sunday morning, June 14th, 1891, and was then in labour. The operation was performed at noon, the os being almost fully dilated, but the membranes intact. She made an excellent recovery and nursed her infant, both leaving the hospital in excellent health and spirits.

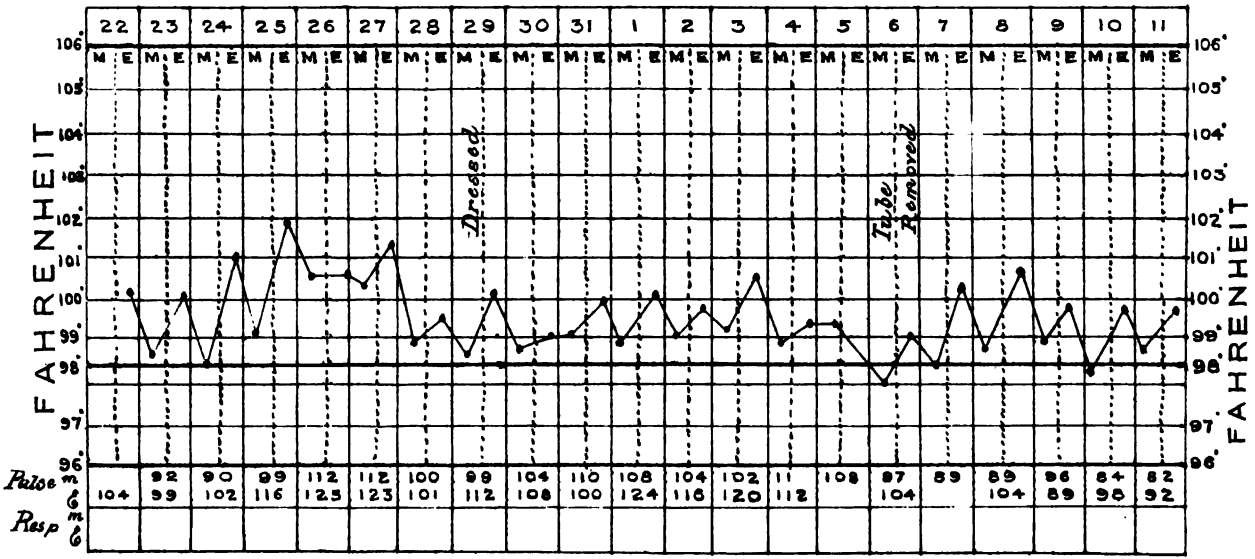
Case II.—C. F., aged twenty-six. Was markedly rachitic, with bow legs, &c. The true conjugate measured 7 cm., or $2\frac{3}{4}$ inches. The abdomen was pendulous, and though the patient had been two days in labour, the waters had long escaped, and prolonged efforts to deliver with the forceps had been made, still the head was freely movable above the brim. I determined to perform Cæsarean section without further delay. The operation was successfully performed, and a living child extracted; but convalescence was protracted by the formation of an abscess which burst through the lower angle of the wound, and discharged about half a pint of pus. The tissues over the child's forehead and neck, which had been crushed by the forceps, sloughed, and an abscess formed in the latter situation; but, ultimately, both mother and child left the hospital in good health.

Case III.—J. S., October 25, aged twenty-five. First pregnancy. No sign of rickets. On palpation the head was found freely movable above the brim. On measuring the pelvis the conjugate of the brim was found to be 7 cms.$=2\frac{3}{4}$ inches, and the transverse $10\frac{1}{2}$ cms.$=4\frac{1}{4}$ inches. Cæsarean section was performed on Sunday, December 13. The elastic ligature was applied and tightened before the uterus was opened, and, though scarcely a minute elapsed before the child was extracted, it was so deeply asphyxiated that it could not be resuscitated. The mother made an excellent convalescence.

ECLAMPSIA.

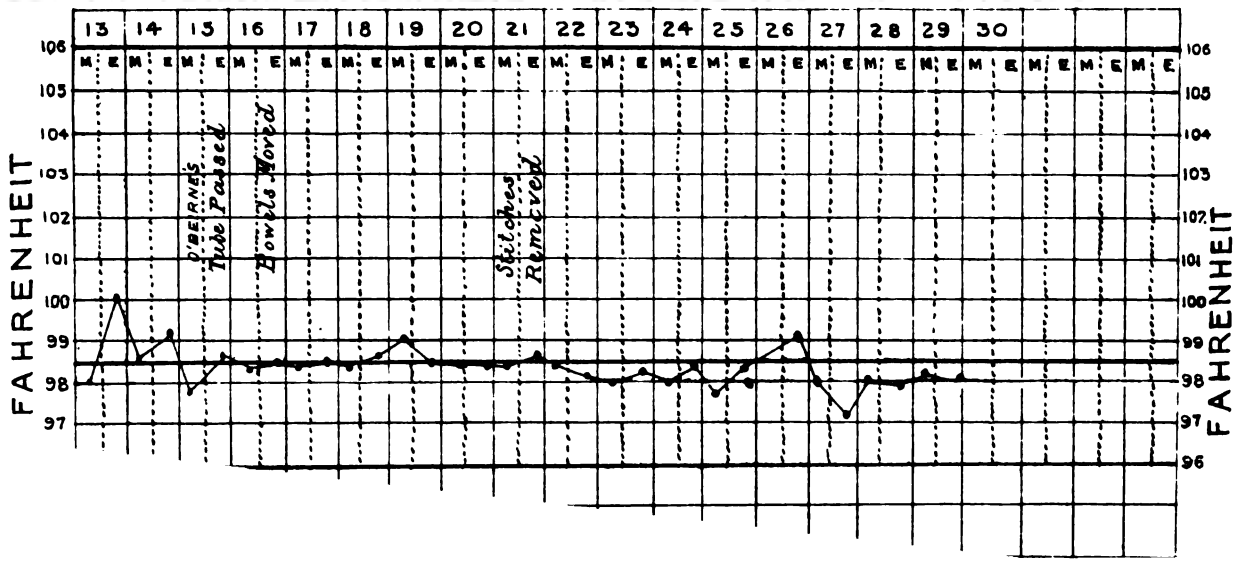
Name.	Result to Child.	Result to Mother.	Remarks.
A. W., 5 ...	D. ...	R. ...	
A. P., 12 ...	D. ...	D. 1 ...	
M. B., 1 ...	A. ...	D. 2 ...	
C. A., 1 ...	D. ...	D. 3 ...	
E. M., 1 ...	D. ...	R.	

C.F. Age. 26. Cæsarean Section. Aug. 22. 1891



Recovery

J.S. Age 25. Cæsarean Section. Dec. 13. 1891.



Name.	Result to Child.	Result to Mother.	Remarks.
C. C., 1 ...	A. ...	R. ...	
M. B., 1 ...	A. ...	D. 4 ...	
J. D., 1 ...	D. ...	D. 5 ...	
T. C., 1 ...	D. ...	R. ...	
N. M., 1 ...	D. ...	R. ...	
F. R., 6 ...	D. ...	R. ...	
M. M., 2 ...	A. ...	R. ...	
M. D., 6 ...	D. ...	R. ...	
M. M., 1 ...	A. ...	R. ...	
M. M., 1 ...	A. ...	R. ...	
M. J., 1 ...	D. ...	R. ...	
C. R., 2 ...	D. ...	D. 6 ...	

There were seventeen cases. Six living children. Six mothers were lost.

Case I.—M. J., age twenty-one; first pregnancy, April 8th, 1890. Post partum. Male, dead, 5lbs. Five fits—the first 14¾ hours after labour. Urine, ½ albumen. Hyd. chloral, per rectum, grs. 40. Pot. cit., grs. 15, every two hours. Vapour bath. Chloroform during fits. Pulv. jalapæ co., grs. 30; no effect. Hyd. chloral, per rectum, grs. 30. Hyoscine, $\frac{1}{75}$ gr., hypodermically. April 9th.—Last fit, 8 55 p.m. Hydrarg. sub. chl., grs. 5. Discharged 16th.

Case II.—M. M., age twenty-four; primipara; November 25th, 1890; hours ill, 13. Male, alive, 7lbs, December 5th. Discharged 14th.

Case III.—M. M., age twenty-one; first pregnancy, January 13th, 1891; hours ill, 14. Sent in from extern maternity. 11 30 p.m.—Had an eclamptic convulsion; never had fits before. First vertex position. Chloral hyd., grs. 45, by mouth; chloroform; F. H. good, 130; head low down; forceps; lacerated perinæum; urine, sp. gr., 1017, highly albuminous. Temperature 100, pulse 106. Female, alive, 6lbs.

Case IV.—M. D., age thirty-seven; sixth pregnancy; April 7th, 1891. Eight months pregnant. Complaining of headache for three days; three fits before admission, ten after. Female, dead, 8½lbs. Chloroform, morphin hypodermically, purgative enema,

chloral hydrate, enemata, vapour bath. Pulv. jalapæ co., hydrar. sub. chl., pot. cit., milk and barley water. Discharged 19th.

Case V.—M. M. L., age twenty-seven; preg. 2; June 8th, 1891. Confined at home. Three fits before admission, one after. Male, alive. Discharged, 16th.

Case VI.—F. R., age forty; preg. 6. July 14th, 1891. Sent in unconscious, states she had several fits at home. No fit after admission. Male, dead, 5 lbs. Discharged, 29th.

Case VII.—N. M., age twenty-one; preg. 1, six months, male, dead, 2½ lbs. September 21, 1891.—Seven fits—vapour bath, hyoscine, calomel. 22nd.—Conscious. 23rd.—Labour came on at 12 50 p.m. 24th.—1 a.m. delivered. Discharged, October 3rd.

Case VIII.—T. C., age thirty; preg. 1; January 15th, 1890. Hours ill, 5½. 7 30 p.m.—Premature breech. Dead, fresh. Urine highly albuminous. Removed to Auxiliary, January 24. Recovery.

Case IX.—E. M., aged twenty-eight; primipara. Three fits. Seven months' fœtus—dead. Discharged, January 19th, 1892.

Case X.—C. C., age seventeen; primipara. December 25th, 1891. Fourteen fits. Developed eclampsia eight hours after delivery of a male, 6¾lb., infant—jalap. ʒi; hydrarg. subchl., grs. v. Chlorof. Discharged, December 26th.

Case XI.—A. W., age twenty-seven; fifth pregnancy; admitted November 28, 1892, suffering from eclamptic fits. Number of fits, three. Vapour bath. Pulv. jal. co., ʒj; calomel, grs. v. Urine highly albuminous. Fits ceased after bowels had moved. Nov. 29.—Eight months' fœtus born dead. Patient recovered. No high temperature.

Case XII.—C. R., age twenty-two; preg. 2; November 30th, 1889. Male, 6¼lbs. Dead. 12 noon.—Fit on admission. Semi-conscious. Os patulous, admitted two fingers. Vertex. F. H. good. Urine scanty, half albumen. Chloroform. Enema—chloral hydrate, 45 grs. 2 p.m.—Hot douche. Os ¼ dilated. F. H. good. Membranes ruptured. Urine ʒiii, albumen. Nineteen fits. 6 25 p.m.—Child born. Fit when passing vulva, and another on placenta being expelled. December 1—Morphia, ⅓ gr. 8 45 a.m.—

Enema chloral, grs. xxx. 9 15 a.m.—Croton oil, one drop. 6 15 p.m.—Patient died.

Case XIII.—J. D., age twenty-five; first pregnancy; was sent in to the hospital from the extern maternity, January 14th, 1890. Patient had had three convulsions before admission; the uterus was the size of an eight months' pregnancy. No fœtal heart could be heard. Patient had seven fits after admission. The os having reached the size of a five-shilling piece, craniotomy was performed at 11 45 p.m. Urine was almost solid on heating—℥iij. Patient died next day.

Case XIV.—M. B., aged twenty-one; first pregnancy; was admitted to hospital April 28, 1890, suffering from eclampsia. Forceps were used, and the child, a female, weighing 7½ lbs., was delivered April 30th alive, but the mother succumbed May 1st.

Case XV.—A. P., aged thirty-three; twelfth pregnancy; was admitted from the extern maternity suffering from eclampsia on November 3, 1891. Patient was an immensely stout woman. Vapour baths were employed, during one of which she delivered herself of a dead born child, which was absolutely blanched. Nov. 4—Patient died from cardiac failure and œdema of the lungs. Her temperature after death was 108°.

Case XVI.—C. A., aged 21; primipara; admitted June 14, 1892, suffering from eclampsia; was delivered June 14 at 10 50 p.m. Forceps were employed, but the child was dead. She had thirty-nine fits. Oxygen was tried without avail, as she died 15th at 9 42 a.m.

Case XVII.—M. B., aged nineteen; primipara; October 27, 1892. Three fits before admission. Chloroform. Chloral, per stomach tube. Hot baths. Eighteen fits. Forceps. Os size of five-shilling piece. Child alive. Developed œdema of lungs, and died of heart failure, October 28.

CASES OF DEATHS FROM NON-PUERPERAL CAUSES.

Phthisis.

Case I.—T. H., age twenty-five, first pregnancy, was admitted to the labour ward on the 25th of December, 1889, in the last stage of phthisis. The os was the size of a five-shilling piece, and forceps

was applied to save the child, as the mother was dying. The infant was a male, alive, and weighed 4½lbs. Patient died during delivery.

Case II.—M. J. M'G., age twenty-four, admitted January 4th, 1891, fifth pregnancy. Delivered January 4th. Was suffering fro n advanced phthisis, both lungs involved. Her labour was normal, with the exception of the placenta, which was adherent, and was removed. The child was a male, alive, weighing 6 lbs. She died five days later.

Meningitis.

Case.—S. N., aged thirty-three, third pregnancy, admitted April 8th, 1890, to await her confinement on the 13th. She developed symptoms of influenza, which was epidemic at the time. Temperature rose rapidly, and she became maniacal. Labour set in prematurely, and was completed rapidly by natural efforts; patient died 6 hours after. Autopsy revealed ozæna of left nostril, and purulent meningitis. Pelvic organs healthy.

Acute Tuberculosis.

Case.—E. C., age twenty-seven, first pregnancy, was admitted June 20, 1890, in a very bad state of health. She was delivered of a male infant, weighing 7½lbs., on June 22nd. Forceps were used; head on perinæum over the time. She died the 25th. Autopsy by Dr. Earl:—Acute Tuberculosis.

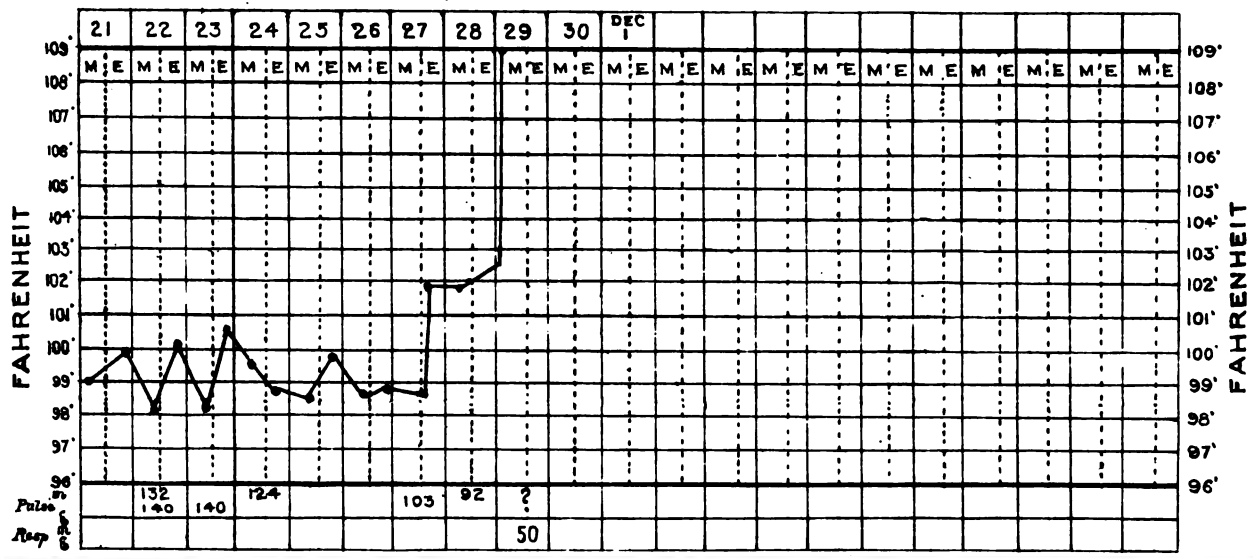
Intestinal Obstruction.

Case.—K. O'N., aged twenty-nine, third pregnancy, admitted October 24th, 1890. Had been ill for three weeks before admission. Greatly reduced by constant vomiting. Complained of pain in right side and absolute constipation. Seen by Dr. James Little. Advised against operative interference. Delivered prematurely, October 29th. Child lived thirty minutes; patient died same day.

Hyperemesis.

Case.—M. F., age twenty-four, first pregnancy. Was admitted to hospital, August 4, 1891, in a collapsed state; temperature sub-normal, and rapid pulse. Her history showed she had been vomiting over a month, was six months pregnant, and the resources of the pharmacopœia had been exhausted upon her without avail by her doctors outside. Died August 6th.

Mrs D. Age 20. Hyperpyrexia. Nov. 20th 1892



Epilepsy.

Case.—E. C., age twenty-eight, third pregnancy. Admitted to Rotunda, May 5th, 1891. Had been epileptic for years, and was admitted in status epilepticus. Delivered May 5th. Died May 6th.

Pneumonia.

Case I.—M. R., admitted January 10th, 1891, with croupous pneumonia. Died January 13th.

Case II.—B. B., age twenty-five; primipara. Was admitted August 5th, 1891. Sent in from the dispensary, where she had come complaining of great pain in the region of her left lung. Delivered August 6th; had a temperature of 102·2° pulse 150. Both remained high till her death, August 9th.

Case III.—M. B., age thirty-seven, second pregnancy. Admitted with broncho-pneumonia complicating labour, July 6th, 1892. Died next day.

Case IV.—A. C., age thirty-eight, tenth pregnancy, weighed 18 stone. Admitted June 23rd, with double croupous pneumonia; temperature 101·6°; pulse, 158; orthopnœa; cyanotic. Delivered shortly after admission; insisted on leaving hospital two hours after delivery, and died at her own home.

Mania.

Case.—M. D., age twenty. Primipara. Admitted November 18, 1891. Inupta; fretting greatly. Delivered by forceps November 20, on account of delay; perinæum lacerated. On the 21st patient took her napkin and binder off, and got out of bed; she was then isolated and specially watched. On the 22nd the stitches were removed, union was good. On the 27th she developed well-marked mania, and became very violent. Hyoscine and pot. brom. were administered. On the 29th she developed a rigor, and her temperature, which up to this had never exceeded 100·6°, rose to 109·4°. Respiration, 50, and pulse could not be counted, 6 30 a.m. Died at 7 a.m. Post mortem by Dr. Earl:—Organs all healthy. No meningitis. No cause of death could be made out.

Mitral Disease. Pulmonary Œdema.

Case.—B. C., age thirty; primipara; admitted to the Rotunda Lying-in Hospital April 8, 1892. Delivered 9th, after 13½ hours

in labour, of a male infant, alive, and weighing 6½ lbs. Died April 9, 1892.

INTERESTING CASES.

Double Monster.

CASE.—M. B., aged twenty-seven; third pregnancy; was admitted to the Rotunda Hospital April 21, 1892. Patient was very large, and twins were palpated, but no second head could be felt. The fœtal heart was strong; a second could not be heard; so that the diagnosis was uncertain. Two right feet prolapsed and one was returned, and the left foot corresponding to the one down, was brought out. The third foot again prolapsed and was returned, but again prolapsing, all four were seized and traction made. After the breeches were delivered delay occurring, an examination was made, and the bodies were found united together above. The delivery effected by the Master was easy, and proved to be a double monster joined from the heads to the navel. The heads were fused together at each side of the occiput, and a face in front and another at the back. There was a hare-lip on one. The two arms, two legs, fingers, toes were normal. Was quite dead when born, and is now in the Museum of the Royal College of Surgeons.

Large Child.

CASE.—The largest child was one weighing eleven pounds ten ounces, and measuring twenty-two inches.

Long Cord.

CASE.—Was coiled four times round the neck, and was forty-six inches long. Mother had four previous pregnancies, and was twenty-six years old.

Atresia Hymenalis.

CASE I.—A. F., aged twenty-two; primipara; hymen obstructed delivery, and was divided by scissors on head bulging. Puerperium was normal.

CASE II.—L. V., aged twenty-one; primipara. Attention was drawn by one of our students to the condition by the small size of the passage on vaginal examination. It was found he was examining per urethram. The tough membrane was incised, and she delivered herself of a living child—breech presentation.

Hyperpyrexia.

We had two cases of very high temperatures—one fatal case of mania, which rose shortly before death to 109·4° (see chart), another in an infant which was premature, and lived in the incubator for a week, whose temperature in the rectum rose before death to 109°.

Interlocking of Twins.

Case.—M. B., aged twenty; first pregnancy; May 12, 1891. Males, 3¼ and 4½ lbs.; first breech; second vertex macerated; interlocking of heads. Vertex of second child perforated as it was diagnosticated dead. The first child died owing to the delay before its head could be delivered. Discharged 20th.

Dr. A. J. Smith said the report was compiled with very great care and accuracy, and admirably condensed. In judging of such reports they have to deal first with the character of the cases, and, secondly, with the morbidity; and then they had to contrast the treatment adopted by the Rotunda School with that of the Continent. He should personally congratulate Dr. Smyly on the head of mortalities. They were simply remarkable, and should satisfy every one. There was no death from puerperal fever for the last two years. Under the head of morbidity it seems an alarming thing that one woman in every nine should have a temperature of over 100·4° in the performance of a physiological function. However, he thought this was more apparent than real, as the percentage of recoveries was over 90 per cent. without any morbidity. He thought Dr. Smyly hit the nail on the head when he found that a great percentage of the high temperatures was due to the patients washing themselves during the puerperal period, and he was pleased to see that since the adoption of new methods the results have been better. He was glad to note that Dr. Smyly had gone back again to the method of washing out the uterus with antiseptics instead of with plain water. He noticed a slight change under the head of operative treatment. Dr. Smyly only employed the forceps once in 23 cases, whereas Dr. Macan employed them as often as one in 16. Dr. Smyly employed the time test—*i.e.*, if a patient was four or five hours in labour in the second stage she should be delivered by the forceps. Still, in the old times the forceps were employed twice as often, and it seemed to him as if the old

primiparæ must have rather a good time of it. He thought it was rather remarkable the small number of old primiparæ in which Dr. Smyly used the forceps. There was no mention of ophthalmia neonatorum, and he would like to know what precautions were adopted as to its prevention. He thought the mortality from eclampsia was very great—6 out of 17. He did not think the treatment for that disease was really satisfactory yet. With regard to accidental hæmorrhage he thought it was a very unfortunate thing to have to treat, but in his opinion placenta prævia was a very manageable complication. He was afraid that plugging the uterus might some day turn out to be not as safe a method as they thought, and where they had a flaccid uterus it took a large amount of material.

Dr. Purefoy said he had some idea of the enormous labour and anxiety involved in the compilation of such a report, and he thought it would possibly add to its value if they could have it at the end of each year. He noticed that there were some cases of the occipito-posterior position, and he confessed that some such cases during the past few years had given him a great deal of trouble and anxiety. He would like to know as to the success of the treatment in these cases. With regard to the treatment of post-partum hæmorrhage, he dissented from the method of plugging the uterus with iodoform gauze. There was no doubt of its efficacy, but, at the same time, it was a very risky method. He preferred the perchloride of iron treatment. He thought bleeding in some cases of eclampsia of great value, although it is opposed by some of the most reliable authorities. He felt that they had in the report a document of great value, and it proved that the time-honoured Institution was splendidly maintaining its prestige under the present management.

Dr. S. W. Thompson said he was in charge of a hospital—that of the South Dublin Union—where very few precautions were taken, and out of 960 deliveries they had not a single death from septicæmia. Of course they had no examinations to speak of, such as are practised in the Rotunda by the students. Then, as to the post-partum hæmorrhage, he never had a case out of the 960 which needed an injection, not even in his private practice. He was glad to hear that placenta prævia was not so formidable.

The President said the first thing they looked to was to the mortality of the institution. Hitherto it was believed that a Lying-in Hospital was very unsafe owing to the danger of

septicæmia. Dr. Smyly has proved that a large Lying-in Hospital is the safest place, because if we look at the last year we find that not a single death occured from septic infection, even though vaginal examinations had to be made by the students. The morbidity was really a great test as to the health of the institution, and they found that the first year it was frequent, the second year less so, and very much decreased the last year. Dr. Smyly has even accredited deaths to the institution of patients who left the hospital after the ninth day, and were re-admitted again. When he was Assistant-Master the number of forceps cases were one in eight, while he now saw that in 1889–90 there were 47 cases of forceps, and that in 1890–91 they fell to 20, while in 1891–92 they rose again to 38. He could not find any variation in the number of primiparæ to account for this. He thought, therefore, that it was a useful thing to have a triennial report in order that they might compare one year with another. With regard to eclampsia, they all knew the fatality of that affection, and the high mortality seemed to him merely a coincidence, as a succession of very severe cases were often met with. His experience of post-partum hæmorrhage was that it seemed fairly frequent. With regard to plugging with iodoform gauze, he only adopted it in one case, and that was successful; the only objection is that one must have a large quantity of it with him. He thought it possibly causes coagulation of the blood in the same manner as cotton wadding. He thought that it acted, however, as a form of drainage tube, and if the patient is already exhausted, a little further discharge might kill her. He agreed with Dr. Purefoy that there was really very little pain from the perchloride of iron, but he thought the danger was that it is used too late. If they took Dr. Barnes' advice and used it early the results would be better. At the same time he could not forget cases of death which resulted from the injection of the iron. The post-mortem revealed that it had entered the sinuses and found its way to the heart. This was especially liable to occur in cases where the woman was exhausted and had no vital energy left.

Dr. Smyly said he did not do this report single-handed. All the hard work was done by Dr. Glenn, who produced these admirable tables. As the representative of the hospital he felt thankful that the report has been received so favourably. When he first went to the hospital he found the forceps were put on very frequently, but he did not think it very scientific, so he determined not to put them on except in case of danger to the mother or child,

and then he found that the necessity of putting them on was very infrequent indeed; also that the woman suffered a great deal of unnecessary pain. Then as to the plugging with iodoform gauze, he merely stated that for the last two years they plugged with the gauze, and that they had no necessity for the iron. If necessary he would have used it. He thought, however, the iron was much more dangerous. Of course the iron was antiseptic, but when it comes to clot it is very liable to become putrid, and therefore it is not absolutely safe. A great amount of gauze is not necessary either. He thought the gauze simply acted by exciting reflex action.

SECTION OF PATHOLOGY.

ANEURYSM OF THE AORTA OPENING INTO THE LEFT LUNG AND PLEURA.

By J. W. MOORE, B.A., M.D. Univ. Dubl.;
Physician to the Meath Hospital, Dublin;
Joint Professor of Medicine, Royal College of Surgeons in Ireland.

[Read in the Section of Pathology, November 4, 1892.]

Case.—On October 12, 1892, Christopher W., a married man, aged 57, by occupation a messenger, presented himself for admission to the Meath Hospital, as he had been suffering for about a week from "spitting of blood." Physical examination showed unmistakable evidence of aortic regurgitation, but the hæmoptysis suggested to my mind that the lesion was probably accompanied by thoracic aneurysm, more particularly as there was an area of dulness on percussion about the left angle of Ludovicus, and the pulse seemed less full in the left than in the right brachial and radial arteries. He was up and dressed when examined, and I confined my attention to the condition of the circulation, intending to complete the physical examination next morning. Unfortunately, during the night profuse hæmoptysis came on, which proved uncontrollable and caused his death, the immediate precursor of which was the fourth of a series of epileptoid convulsions of great severity.

The *post-mortem* examination was made with much care by Dr. James Craig, and the following notes were taken by Messrs A. H. White and G. Woodside, the Clinical Clerks:—

"On opening the thorax, the right lung seemed to be more collapsed than usual—its anterior edge was emphysematous. Owing chiefly to the retraction of this lung the heart and great vessels were at once seen to be greatly displaced to the right of the middle line (concentric displacement). But there was also excentric displacement. The left lung and pleura occupied half of the thoracic

cavity, and on opening into the left pleura it was found to be greatly distended with blood-clot. The upper lobe of the left lung—more especially its lower, inner, and posterior portions—was almost black from extravasated blood. The adjacent part of the lower lobe presented a similar appearance. On closer investigation it was seen that the blood had obtained entrance into the pleura by an opening in the inner part of the interlobular septum, having flowed through a somewhat irregular channel in the torn lung tissue, partly in the lower, but mainly in the posterior and inner portions of the upper lobe, almost at its junction with the lower lobe. The descending aorta was found to be adherent to this lower, inner, and posterior part of the upper lobe. The vessel was also in communication with the lung by a circular opening in its walls. This opening was somewhat larger than half-a-crown, with a rounded and slightly thickened circumference. Corresponding to the defect in the wall of the aorta just described, the bodies of the fifth and sixth dorsal vertebræ were eroded—the latter slightly, the former to a considerable depth, while the intervening intervertebral cartilage stood out prominently—having (as is usual in such cases) resisted the eroding process. The whole arch of the aorta was widened and atheromatous, with numerous calcareous plates and patches. The aortic valves were rigid and had exceptionally large corpora Arantii.

"The liver weighed 4 lbs. 3 ozs.

"The kidneys were normal in size and also in appearance on section."

As regards the patient's previous history, I may mention that in October, 1888, he was under the care of my colleague, Dr. Foot, for "spastic paraplegia," and that, in May, 1889, he spent 20 days in hospital under my care, when the physical signs of aortic regurgitation were well marked.

In Dr. Stokes' classical work on "The Diseases of the Heart and Aorta"[a] will be found a most instructive account of the occurrence of hæmorrhage in aneurysm. Dr. Stokes quotes the views of Dr. W. T. Gairdner, of Glasgow,[b] as to the nature of certain cases of hæmatemesis,

[a] Dublin: Hodges & Smith. 1854. Pp. 580, *et seq.*

[b] Edinburgh Medical Journal. Third Series. Vol. I. 1850.

in which he holds that the bleeding results from the leaking of an aneurysmal tumour. Having instanced many cases of hæmorrhage in aneurysm, Dr. Stokes describes two cases in which successive hæmorrhages in quantity took place from a thoracic aneurysm. In each case the opening of the sac was into the right pleura. In one of these cases there were two, in the other three, distinct hæmorrhages. In the latter instance "sudden and stormy death" occurred in Dr. Stokes's presence as an almost instantaneous result of the third attack of hæmorrhage. "Immediately before the attack the patient appeared perfectly well. He was cheerful, had a good colour, a full, strong, and regular pulse; his appetite was good and respiration tranquil. He had occasion to turn on the left side, when, in an instant, a fearful attack of convulsions came on. The pulse disappeared, and after a few spasmodic respirations he was dead. On dissection, the whole sac of the pleura was found filled with blood, which had separated into crassamentum and serum." The aneurysm had ruptured at the lowest portion of the thoracic aorta. The heart was healthy.

Dr. Stokes adds: "In most instances of sudden death we observe syncope, with or without convulsions or asphyxia. The occurrence of either of these conditions depends, in a great measure, on the direction of the hæmorrhage. If the aneurysm burst into a serous sac, or into a free canal, such as the œsophagus, fatal syncope may be the result; while death by asphyxia is produced when it opens into the air-passages, or into the substance of the lung itself, which may be at once and extensively lacerated by the torrent of blood."

The case now detailed was manifestly, in the first instance, one of endarteritis, leading to atheromatous ulceration of the aorta. At the same time the marked

erosion which two vertebræ had undergone proves that aneurysmal dilatation had taken place on the posterior aspect of the aorta, and this actually was so.

The course of events in the present instance was no doubt a chronic endarteritis, followed by fatty degeneration and softening beneath the intima (atheromatous abscess). Then an atheromatous ulcer formed owing to the disappearance or tearing of the intima, and finally ulcerative or necrotic processes extended to neighbouring structures—a portion of the lung coming ultimately to form part of the wall of an aneurysmal sac.

SHORT NOTES UPON A CASE OF TRAUMATIC MALIGNANCY REQUIRING AMPUTATION AND SUBSEQUENT DELIGATION OF THE FEMORAL ARTERY AND VEIN.

By WILLIAM I. WHEELER, M.D., F.R.C.S.;
Surgeon to the City of Dublin Hospital.

[Read in the Section of Pathology, November 4, 1892.]

THE gentleman to whom the specimens exhibited belong, is a young man under twenty-six years of age, of a pale complexion and slight figure, who was up to January of the present year in good health. In that month he hurt his right knee by falling against a granite stone support, when endeavouring to leap a chain. Although he suffered intense pain from the injury, he did not seek advice until April (this year), at which period his knee joint was circumferentially half an inch larger than his sound joint, caused by effusion, besides there was a marked circumscribed enlargement upon the inner and upper part of the tibia just below the articular surface. The effusion into that joint subsided under treatment, the tibial growth rather increased, and was followed by slight glandular enlargement situated in, and corresponding to, the saphenic opening. Suffice it to say that amputation was performed at the lower third of thigh and that the stump healed kindly to cure.

The enlargement in groin region for sufficient reasons was not removed at the time of the amputation; it however increased in size as the patient convalesced. I advised removal, which I did two months ago, having at the time of removal first ligatured the femoral artery and vein at the

distal and cardiac sides of the tumour, and about one inch from the tumour at either side. The patient writes that he has recovered. I may add that upon careful examination, under an anæsthetic, there could not be detected any enlargement in the abdominal or other regions. It is evident that the tibial growth originated in the periosteum and that the glandular growth was soft where it lay under the skin, but osseous where in proximity to the vessels. Dr. Graves has kindly examined the specimens. I append his report as follows:—

"The head of the tibia is much enlarged, especially on the internal and posterior aspects; the capsule of the knee joint is much thickened, but the joint itself is intact. On the lower end of the femur are two small sarcomatous growths. On section of the head of the tibia it became evident that the cancellous portion of the head of the bone had become infiltrated with the new growth, as had also the upper third of the medulla. Externally the head of the tibia is surrounded by new growths in which are many islands of bone. The gland removed from the groin is composed of two portions: one, which partially envelopes the femoral vein and artery, has a large piece of bone in the centre; and the other portion, which lay under the skin is soft.

"One side of the femoral vein is much thickened, and will be seen under microscope No. 1. Its wall is infiltrated with sarcoma cells. A section of the soft part of the gland from the groin will be seen under microscope No. 2.

"The new growth in the head of the tibia is an osteosarcoma; the gland from the groin is infiltrated with osteosarcoma. The gland is especially interesting, as sarcoma does not generally spread by the lymphatics. Probably the gland got affected from the femoral vein. The growth evidently started in the periosteum. The accompanying photographs show the appearance of the leg before section, and of the gland when laid open.

"Dr. Gould, in the *Lancet* of December 5th, 1885, page 1035, brings forward three cases of sarcoma following injury to bone—two in humerus and one in the femur—two of these recurred. Paget, in his 'Lectures on Surgical Pathology,' page 685, mentions two cases, one of medullary sarcoma in the lower third of femur in

a boy. Stanley (2 cases), Travers, Jonathan Hutchinson, Dupuytren (3 cases), and Parkes mention cases of sarcoma following injury; Barwell speaks of two cases, which he calls 'acute traumatic malignancy;' Butlin mentions a case in a man who strained his knee by a fall, and within three weeks a sarcomatous tumour appeared. He also mentions six other cases of traumatic malignancy in bone. There are other cases on record.

"We have all seen sarcoma develop in the bone, and have been unable to get any history of injury; but, on the other hand, there is quite sufficient evidence to prove that in a certain proportion of cases a single injury does excite the growth of sarcoma in bone.

"I have met with carcinoma, epithelioma, and sarcoma arising within a few weeks of an injury, where there has been no breach of the skin. In these cases it would be interesting to hear the explanation offered by those who believe in the coccidia as a factor in malignant disease."

EXTENSIVE INTESTINAL ULCERATION IN TYPHUS ABDOMINALIS AMBULATORIUS, FATAL BY CONVULSIONS ON THE 9TH (?) DAY.

By J. W. MOORE, B.A., M.D. Univ. Dubl.;
Censor and Vice-President, R.C.P.;
Physician to the Meath Hospital and County Dublin Infirmary.

[Read in the Section of Pathology, November 4, 1892.]

On the afternoon of Wednesday, October 26, 1892, Dr. Robert Shaw Wayland telephoned to me to ask whether I could admit to the Meath Hospital a commercial traveller, aged twenty-nine years, who appeared to him to be suffering from enteric fever. The patient was admitted forthwith, but I did not see him until the next morning, when I visited him for the first and only time. Dr. Wayland kindly furnished me with the following particulars:—

Previous History.—When Dr. Wayland first saw Mr. C. J. M'L. some years ago, he was a strong, robust-looking young man, and apparently healthy in every respect. From that time until just before his death there was a history of alcoholism, especially marked within the last two or three years. He complained repeatedly during the past twelve months of dyspeptic symptoms, and on the 17th of last August he had an attack of hæmatemesis. On Wednesday, October 26, at 1 p.m., he called to consult Dr. Wayland at his residence, accompanied by a friend. He looked exceedingly ill and weak. His temperature was taken and found to be 103·0°, and his pulse was 120. The respirations were rapid and shallow. The pupils were slightly dilated. The tongue was thickly coated and his breath was foul. In answer to

Dr. Wayland's inquiries, he stated that he had not felt as well as usual for about a week previously. He did not, however, appear very decided upon this point. He said that he had been attacked with slight headache, pains in the abdomen, diarrhœa, and vomiting on the previous Saturday (October 22nd). Some friends, however, remarked that he looked well on that day. On Sunday, the 23rd, he stopped with a friend, who informed Dr. Wayland that Mr. M'L. was in good spirits upon that day, but that he suffered from diarrhœa and sickness of stomach, and ate hardly anything. Next day, Monday, he went to the country to resume his business as a commercial traveller, but felt too ill to remain at work, and so returned to Dublin on Tuesday, and took a Turkish bath in the evening.

Mr. M'L. was admitted to the Male Epidemic Ward of the Meath Hospital on the afternoon of Wednesday, October 26. At the time of admission his axillary temperature was 105·2°, and his pulse-rate was 114 per minute. Tepid sponging reduced the temperature to 104°. The respirations were hurried--36 per minute—of the cerebral type. When I saw him next morning I was struck by his agitated, nervous expression. He had passed a restless night; the temperature was still 104°; the respirations were again 36, and the pulse had risen to 140. There was albuminuria. The abdomen was tympanitic and tender on pressure, but the bowels had acted only once since his admission. Both liver and spleen appeared enlarged. A glycerine and water compress was applied to the abdomen. It was ordered that the patient was to be thoroughly sponged at least twice a day, and sulphonal was prescribed in two 20-grain doses as a hypnotic at night. He did not live to get even one of these doses.

After tepid sponging, the temperature fell to 103° at noon. The prospect seemed brighter for a time, but as the afternoon wore on, the temperature rose to 104°—notwith-

standing profuse sweating, and symptoms of *delirium tremens* developed, accompanied by great restlessness—the patient constantly trying to get out of bed.

At 6 30 p.m. he succeeded in getting out of bed, and while endeavours were made to put him back he became quite rigid. At 7 30 p.m. a violent epileptoid convulsion occurred, attended by permanent loss of consciousness. The fits recurred twice, and in the third attack at 9 p.m. he suddenly expired.

A *post-mortem* examination was held at 11 a.m. of Thursday, October 28, 14 hours after death. No clot or other lesion was found on examination of the brain. The liver was of enormous size. The spleen was also enlarged, but to a less degree. It was darker in colour than usual, but not much softened. The lungs and heart were healthy, nor was any morbid change observed macroscopically in the kidneys. The mesenteric glands were much enlarged, and the mesentery and omentum were loaded with fat. There was no evidence of peritonitis.

But the most remarkable and interesting feature in the pathology of the case was the extraordinary amount and extent of disease in the agminate and solitary glands of the small intestine, while the colon was practically free from disease—the morbid changes stopping short abruptly within the limits of the ileo-cæcal valve. Superficial ulceration had begun in the glands for some distance back from this valve, but higher up in the ileum, for at least seven feet, the stage of *engouement* was markedly present.

ADENOMA OF THE KIDNEY IN THE ADULT.

By CONOLLY NORMAN, F.R.C.P.;

Medical Superintendent, Dublin District Asylum.

[Read in the Section of Pathology on December 2, 1892.]

THE comparative rarity of the specimen which I present forms my reason for exhibiting it, since I do not think I have any new light to throw upon the origin of the condition presented. I cannot find any mention of a similar case in the long records of the Dublin Pathological Society, the parent of this Section, nor do the Transactions of the Pathological Society, London, contain any satisfactory description of the affection here dealt with. The English treatises on diseases of the kidney merely mention adenoma in the briefest and most casual way as a rare form of tumour in that organ.

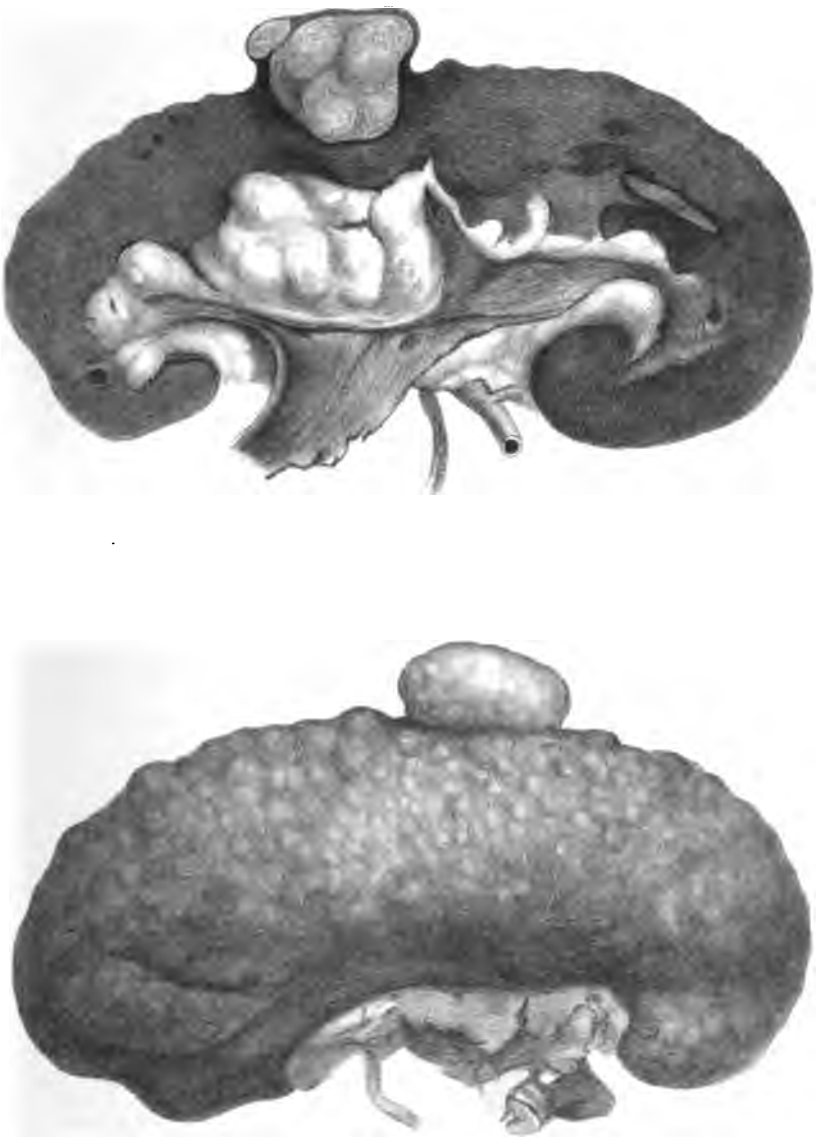
CASE.—The patient, in whom was found the growth about to be exhibited, was a man, fifty-three years of age, who died in the Richmond (Dublin District) Asylum in April, 1892. He had been an inmate of the Asylum for two months. There was absolutely no history of his previous life, save what is contained in the facts that he had been a soldier and had served in India. He admitted to rather intemperate habits. He had a stricture about the junction of the membranous and prostatic portions of the urethra, which gave him little trouble, and readily permitted the passage of No. 5 catheter. He presented a slight degree of general anasarca. His superficial arteries were tortuous and rigid. Mentally he suffered from chronic paranoia with persecutory delusions. His general condition was feeble throughout. The immediate apparent cause of death was a sharp attack of diarrhœa, which came on about a week before the end and proved intractable.

Post-mortem.—The body exhibited slight general anasarca. The brain showed signs of chronic wasting, thickened pia, and wasted

convolutions. The arteries of the circle of Willis were extensively atheromatous. The left pleural cavity contained about eight ounces of clear fluid, the right was contracted by old adhesions. The pericardium contained a slight excess of fluid. The heart was enlarged, particularly the left side, and the left ventricular wall was much thickened. The aorta presented numerous atheromatous patches. The liver was of average size and consistence, and showed to the naked eye no sign of cirrhotic change. The ileum presented scattered patches of engorgement, and the large intestines were pretty uniformly injected. There was no ulceration. The lower bowel contained a quantity of ropy mucus. An old stricture existed at the junction of the membranous and prostatic portions of the urethra. The bladder wall was much thickened, rugose, and contracted. The summits of the rugæ were covered with a thin layer of a whitish, gritty material, easily washed off with a stream of water. The ureters were dilated but not tortuous, and their walls were thickened. The left kidney was diminutive, its greatest diameter on vertical section being 7 centimetres (2¾ inches). The pelvis was relatively dilated. It was impossible with the naked eye to distinguish between cortex and medulla, the colour being uniform, and the projection of the pyramids being absent. The substance representing cortex and medulla varied in thickness from 2 to 7 millimetres—in other words, was little over ¼ of an inch at its thickest part. It presented on section numerous pouting vessels with manifestly thickened walls. The external surface of the organ was irregularly nodulated. Under the microscope, sections exhibited in marked degree the ordinary appearances of chronic interstitial nephritis. Nevertheless, it is singular to observe that, notwithstanding the extreme degree of atrophy, even the narrowest portions showed numerous tubules and some glomeruli that differed little from the normal, and there were nowhere considerable tracts of tissue that had lost all semblance of glandular structure such as one not unfrequently sees in kidneys much less wasted.

The right kidney was also contracted, though in a far less degree than the left. It measured in vertical diameter 10·8 centimetres (4¼ inches). The cortex was much wasted. In colour and apparent structure, the cortex and medulla were not readily distinguishable. The pelvic fat was abundant. Section showed numerous patulous vessels with thick walls. The external surface was pretty uniformly "granular."

In this kidney a new growth existed. It projected 9 millimetres



ADENOMA OF KIDNEY.

F Huth, Lith.

from the convex exterior border of the kidney, just below the middle of that surface. Externally it was closely covered by the capsule of the kidney, wherein, in this position, ran a great number of vessels—some encircling the base, others running over the surface of the growth. The tumour from the outside showed an expansion above the base, thus approaching to the pedunculated form.

The surface of the new growth was nodular. It was of a lighter colour than the rest of the kidney. When the capsule of the kidney, which adhered closely to the tumour, was removed, the latter showed a dirty white tint.

On section the tumour was seen to project into the substance of the kidney for about the same distance as it projected beyond the surface of the organ. The accompanying plate shows the relative proportions accurately, but as the drawing was made after the specimen had been hardened, there is a slight uniform diminution in size.* The tumour was marked off from the kidney structure by a thin fibrous-looking dark-coloured capsule, from which thicker bands extended into the new growth. In these dissepiments the openings of minute vessels were here and there distinguishable. On the projecting surface of the tumour, this fibrous structure seemed to become continuous with the thickened capsule of the kidney.

Examined microscopically, the right kidney presented the typical appearances of the chronic cirrhotic kidney—"granulations of Bright" separated by atrophic bands, containing proliferated connective tissue and small-celled infiltration. In the granulations the uriniferous tubules had generally become considerably dilated. The glomeruli, in many cases, presented great thickening of the capsule by a concentrically arranged fibrous-looking connective tissue containing nuclei. The interior of the glomerulus often showed a granular deposit or exudation containing a few nuclei. Here and there glomeruli had undergone colloid degeneration. Many of the tubuli contorti had lost their epithelium, in others the epithelium was much degenerated, and some had undergone colloid change. The arterial walls were much thickened, all the coats being involved. Around the portion of the tumour which lay within the kidney substance, there was a zone of atrophic tissue infiltrated with small

*The plate fairly represents the naked-eye appearances of the kidney and tumour, but the lumpy and projecting aspect given to the section of tumour and to the pelvic fat is incorrect.

cells and containing highly degenerated tubuli and glomeruli, many of which exhibited colloid change. In this zone there were many thickened vessels and a great number of blood extravasations.

Between the kidney structure and the tumour lay a distinct band of connective tissue, thicker in some parts than in others, but nowhere interrupted. It consisted of wavy fibres with scattered elongated oat or rod-shaped nuclei. This proper capsule of the tumour sent out bands which were gradually lost in the connective tissue of the degenerated kidney substance, and from this capsule trabeculæ passed into the tumour. These trabeculæ broke up rapidly into very fine bands, enclosing alveoli of pretty uniform size. The larger trabeculæ contained numerous large thin-walled vessels and many vascular dilatations, resembling, as Sabourin says, the sinuses of a cavernous angioma. The smaller trabeculæ consisted of connective tissue of great delicacy provided with few nuclei, and contained vessels which seemed to be destitute of a proper wall as well as sinuses similar to those described. The walls of the alveoli were of extreme tenuity, and I failed to make out anywhere a membrana propria like that of the uriniferous tubules. Sections of the tumour, which had been hardened in Müller's fluid, having been stained and mounted in glycerine, revealed, though imperfectly, the condition above described and little else. The inter-alveolar structure was obscured by an enormous accumulation of highly refractive fat globules and fat crystals. Treatment with ether, or absolute alcohol and clove oil, removed most of the fat, and enabled one to recognise the structure of the preparations more perfectly. One then found that the alveoli were lined with large epithelial cells, mostly of the cylindrical type, containing a faintly staining protoplasm indistinctly granular, and towards the base of the cell a nucleus which stained well and sometimes presented a distinct nucleolus. Some of the alveoli strongly resembled uriniferous tubules, presenting in long section a distinct lumen bordered on each side by a row of cylindrical cells, and occasionally one got such a tube in cross section with a lumen surrounded by a circle of cells. In other places the structure was less distinct, and the cells seemed to fill up the alveoli, leaving no lumen. Some of the alveoli contained several layers of cells, and in these the form commonly approached that of cubical epithelium, especially in the layers remote from the alveolar wall. In many alveoli there was a broadening at either end and a narrowing between, which appeared to be caused by the tube being bent

upon itself, and recalled the appearance familiar in the dilated tubuli contorti of a Bright's granulation. Very frequently the alveoli which bordered the capsule of the growth or one of the larger trabeculæ, presented on section a fusiform shape, suggesting that a tube forming a segment of a large circle had been cut tangentially. Towards the centre of the lobules of the growth the structure became more confused, the alveoli looked less regular, the cells were smaller and more irregular in outline, and seemed more tightly packed. Throughout the alveolar mass there were numerous hæmorrhages. In some places blood corpuscles seemed to have found their way between the rows of cells into the lumen of a tube, and were contained within a double row of cells which still retained the appearance of epithelial cells. In others the circumjacent structures had been torn up by hæmorrhages. Very often among the alveoli, and not apparently connected with the vessel-bearing trabeculæ, there were relatively large and densely packed masses of blood corpuscles surrounded by a single row of very delicate, flat, nucleated cells, and without any other wall. Throughout were numerous cavities which had contained blood, and to which a few blood corpuscles still adhered—some were mere holes surrounded by broken down epithelial cells, others were cavities lined as above described. I did not find any non-hæmorrhagic cysts, apparently derived from a dilatation of the alveoli, and comparable to the cysts in interstitial nephritis, such as have been described by Sabourin.

The sections exhibited under the microscopes show the various appearances described respectively in the left and right kidney, and in the different portions of the tumour.

As to the exact nature of tumours of the kidney in the adult of the character above described there has been some difference of opinion. Waldeyer, to whom Sabourin gives the credit of being the first to describe the condition, regarded it (Virchow's Archiv., B. 41. Ueber die Entwicklung der Carcinome) as being a variety of carcinoma which has undergone a sort of arrest of development. Two years later Klebs, in an early edition of his Handbook of Pathological Anatomy, recognised these growths under the names of adeno-carcinomata and adenomata of the kidney. The most exhaustive of the earlier works is that of Sturm (Ueber

das Adenom der Niere, u.s.w. Archiv. der Heilkunde, 1875). Sturm held that these tumours, which he called adenomata, arose through a proliferation of the epithelium of the convoluted tubules. His descriptions are minute and accurate.

Later, Sabourin, of Paris, published a series of exceedingly able monographs on this subject, of which the first appeared in 1882.[a] He has collected a large number of cases, and his descriptions leave nothing unsaid. He tells us that these tumours are generally small, sometimes very small, yet at times attaining the size of a hazelnut, walnut, or even hen's egg. They are usually situated in the cortex, immediately under the capsule which extends over them. Mostly they are single and confined to one kidney, but they may occur in both, and "in certain cases, indeed, the surfaces of the cirrhotic kidneys are so to say sprinkled all over with them." Sabourin considers that the renal adenomata are "lesions of which the history ought not to be separated from that of cirrhosis of the kidney," that they are, in fact, an accident of renal cirrhosis. In all recorded cases they appear to have been associated with that condition. Sabourin holds with Sturm that adenomata arises through a proliferation of the epithelium of the tubuli contorti. He divides them into two classes—(1) tumours having epithelial cells of the cylindrical type, and (2) having cells of the cubical type. These are stated by Orth to correspond to the two divisions of renal adenomata made by Weichselbaum and Greenish (Wiener Med. Jahrb., 1883)—namely, alveolar and papillary. W. and G. believe that the alveolar variety arises in the convoluted

[a] Contribution a l'étude de la cirrhose rénale. Étude sur quelques variétés de tumeurs du rein. Archiv. de Physiologie. T. IX. 1882

Sur quelques cas de cirrhose rénale avec adénomes multiples. Revue de Médécine. T. IV. 1884.

Les adénomes hæmorrhagiques du rein. *Ibid.*

Adénome volemineux du rein ayant donné lieu à la production de nodules secondaires dans le poumon. Sabourin et Oettinger. Rev. de Médécine T. V. 1885.

tubules, and the papillary in the collecting tubules. The cubical-celled variety has a tendency to form, in the interior of wide cavities lined with cubical epithelium, elevations of a lamelliform or papillary character, sometimes branching out into arborescent forms of a highly compound nature.

Sabourin, however, believes that both the cylindrical and the cubical-celled arise from the convoluted tubes, and he thinks that the difference between them results from the fact that the former originate where the epithelium is still cylindrical, and the latter where degeneration has advanced further, and the epithelium has become cubical. The first variety begins, says Sabourin, in the comparatively healthy epithelium in the midst of a granulation of Bright, and it tends to limit itself and become encysted by rapidly invading the entire granulation, and being arrested by the contracting connective tissue which bounds the granulation. On the other hand, the cubical-celled variety originates amidst the fibrous portions of the contracted kidney where the degenerated epithelium has assumed the cubical form. It is often imperfectly encapsuled. With regard to the formation of the alveoli, Sabourin believes that the new growth begins in either form by proliferation of the epithelial cells covering connective tissue lamelli protruding into the cavity of a dilated tubule. These lamellæ branch again and again, and eventually the twigs become united at their various extremities, the connective tissue becoming rapidly thinned out into delicate fibres, and thus the appearance of alveoli and tubules is produced. According to this view, such a tumour as that which I have described would be a growth of considerable age, while the papillary growths would be younger conditions.

Sabourin traces an analogy between renal adenomata in the two varieties which he describes, and kindred adenomatous degenerations in the liver. The cylindrical-celled renal adenomata are of the same nature as the growths

called *hepatic polyadenomata* by Kelsch and Kiener (Archives de Physiologie, 1876); the cubical-celled correspond to the *biliary polyadenomata* of the same authors. The analogy is obvious, but it would lead us too far afield to consider it in detail. Sabourin argues that his cases constitute a special class of new growths in the kidney, because they coincide with cirrhosis of the kidney, and result from a quite local process, and appear to have a constant tendency to become encysted.

Grawitz, in an article on "The So-called Lipoma of the Kidney," in the ninety-third vol. of Virchow's Archiv., 1883, maintains that while the growths showing branched lamelliform papillæ may originate from the epithelium of the uriniferous tubules the tubular (alveolar) growths, such as the one which I describe, have entirely a different origin. He believes that they arise from the proliferation of embryonic fragments of displaced adrenal tissue. It is well known that accessory adrenals are common, and that fragments of displaced adrenal tissue are occasionally attached to the kidney. Orth points out, indeed, that such fragments may be found anywhere between the supra-renal capsules and the generative glands, and seeks a reason for this in the close proximity of the two organs before the descent of the latter (Lehrbuch der speciellen pathologischen Anatomie, B. II., s. 3.) These fragments consist almost exclusively of cortical supra-renal substance, and always exhibit the characteristic loading with fat. Now Grawitz believes that in an early stage of the development of the kidney, fragments of adrenal tissue, transported from their normal position, come into contact with the kidney, and lie between two renculi, the latter developing close in the aberrant growth, while the common capsule of the kidney grows over it. Thus are accounted for the fibrous covering of the tumour, its adenoid structure, and the fatty degeneration which it

shows. As a matter of fact, it seems that Grawitz chiefly bases his views on this fatty change. This appears rather whimsical unless it is made appear why this fatty degeneration should be confined to the cortical tissue of the adrenals. Grawitz also objects to Sabourin's view that the epithelial tissue of the tubuli contorti having begun to degenerate, and having become cubical, can then actively proliferate. Here the analogy of the two classes of growths in the liver, described by Kelsch and Kiener, may, perhaps, support Sabourin, but if one adopts the view of Weichselbaum and Greenish above referred to, this difficulty does not arise.

Against Grawitz' views, and in favour of Sabourin's general interpretation of these conditions, are the following facts:—

1. Adenoma in either form in the adult, is always associated with renal cirrhosis.

2. Though the tendency is towards encystment, there is not always a capsule. In one of Sabourin's cases the capsule was absent, and though the growth was mostly alveolar, part was papillary. Here Sabourin demonstrated also a gradual transition from tubuli contorti to adenomatous tissue.

3. In some other cases recorded by Sabourin the types were mixed. In portions of growth tubules with cylindrical epithelium occurred, in part loculi filled up with compound papillæ.

These facts are to be expected either on Sabourin's or Weichselbaum and Greenish's theory, but are unaccountable on Grawitz'.

4. Finally, the cubical-celled and papillary growths are characterised, as Sabourin's cases show, by the identical same tendency to fatty change which Grawitz claims as being characteristic of the alveolar varieties (supra-renal according to him), which he proposes to call "strumæ supra-renales lipomatodes aberratæ."[a]

[a] Orth, who writing in 1889, states Grawitz' views so strongly as to make them his own, admits of no doubt that the papillary growths are true adenomata.

On the whole, then, I believe that I am justified in calling the growth now exhibited an adenoma of the cylindrical-celled type of Sabourin or of the alveolar variety of Weichselbaum and Greenish. The appearances presented are identical with those which will be found described at greater length and with much ability in the first four cases by Sabourin in his first paper.

Two points of interest not directly arising out of my case may be referred to. The tendency to extensive hæmorrhage in these tumours is great, as might be expected from their structure. In a case described by Grawitz, an enormous hæmorrhagic cyst was formed, and extravasation may have been the immediate cause of death. The subject has received the attention of Sabourin in a paper above referred to.

There seems to be a tendency to the development of carcinoma in these growths. In Grawitz' case there was secondary infiltration of the lung, and a similar case is recorded by Sabourin and Oettinger. As a general rule, of course, they are benign.

The PRESIDENT said that this was the first specimen which, to his knowledge, had been exhibited in Dublin. It was indeed a pathological curiosity, and he knew of no physical signs by which the lesion could be diagnosed. He said he would like to ask Dr. Norman whether the tumour might arise from some of those cystic forms which are so commonly met with in cases of contracted kidney, and also what was the condition of the heart, and of the left ventricle in particular.

DR. NORMAN said, in reply, that in one of the specimens under the microscopes in a granulation of Bright there were to be found a number of dilated tubes the epithelium of which appeared to be proliferating. The patient's heart was hypertrophied as a whole, and the left ventricle in particular.

HYDRONEPHROSIS.

By CONOLLY NORMAN, F.R.C.P.;
Medical Superintendent, Dublin District Asylum.

[Read in the Section of Pathology, January 13, 1893.]

A CASE of true obstructive hydronephrosis is sufficiently rare to merit a brief notice in this section.

CASE.—The woman from whom these viscera were removed was a patient in the Richmond District Asylum, Dublin, for little over a year. As is the case with too many of my patients, received from the police courts, and certified at sight, there was no history of any trustworthy kind. However, there could be no doubt that the woman had led a very loose life in every way. On admission she suffered from general paresis. Mentally her symptoms were those of the tranquil and demented type of that affection. She presented no distinct indication of syphilis. She never exhibited any symptoms pointing towards renal or urinary trouble. In the spring of 1892 she contracted influenza, a very severe form of which was epidemic in the institution at the time, and she subsequently developed pneumonia with pleurisy, of which she died after a short illness. There is nothing special to be noted in the symptoms or course of the lung affections.

Post-mortem.—The nervous centres exhibited the usual lesions of general paralysis. There were no signs of syphilis in the other viscera. Heart normal. Patches of atheroma in the aorta. Middle and lower lobe of right lung in a state of red hepatisation passing into grey below. The pleural surface of the hepatised lobes was covered with a very thick layer of yellowish lymph. Liver very slightly cirrhosed. Spleen large and soft. There were well-marked signs of chronic cervicitis, otherwise the genitalia were normal.

The right side of the abdominal cavity was occupied by a large tumour, which had displaced the intestines and pushed up the liver. It was evidently the right kidney converted into a large multilocular cyst with a leathery wall and fluid contents. The tumour was distinctly loculated, but not so deeply as in cases of congenital

cystic kidney, and the loculi were few in number—some six on the surface of the kidney which lay anterior. In greatest vertical length the tumour (sacculated kidney) measured 21 centimetres (about 8¼ inches), its horizontal circumference at the hilus was about 20 centimetres (say 7⅞ inches), but its circumferential measurement varied at different parts owing to the degree of bulging of the sacculi, &c. The kidney contained almost 22 ounces of clear inodorous fluid, containing a few sparkling particles, a few small flakes of a whitish greasy-looking substance. A section made in the usual plane shown that the kidney consisted of about ten sacs of different sizes, the largest being at the superior and inferior extremities. Some of these loculi were not perfectly separated from each other; others were shut off from the rest by tough fibrous dissepiments which closed in towards the centre in such a way that the loculus communicated with the dilated pelvis by a funnel-shaped opening. Ridges of a similar material divided the loculi, which were not completely shut off save at the funnel-shaped opening. Some of the loculi were not slit up by the ordinary incision, but their opening into the pelvis was evident. To the naked eye there was no trace whatever of normal kidney structure; the mass presented simply the appearance of an agglomeration of leathery-looking sacs opening into a common cavity by generally narrowed mouths, and circumscribed by a common wall which preserved the general outline of an unusually lobulated and much magnified kidney. The outer wall of the loculi, representing the cortex of the kidney, varied in thickness from 1½ to 5 millimetres, but the general thickness, which was pretty uniform, was little under 2 m. The trabeculæ between the sacs varied in thickness from 2 m. to 1½ centimetre. The larger showed a very distinctly fibrous structure, and cut like strong fibrous tissue. One large mass which lay at the base of several loculi, separating them from the pelvis, cut with gristly firmness, and contained within fibrous walls a quantity of fat. The right ureter was throughout dilated, save at its lower extremity, and its wall was much thickened. About its middle third there was a remarkable fusiform dilation for about three inches of its length. Towards the lower extremity the ureter somewhat abruptly narrowed, and became converted into a tough rounded cord without lumen for about one inch from the bladder. The latter viscus seemed perfectly normal, save that it presented no trace of an opening for the right ureter; the mucous membrane in this position was quite smooth, and

showed no sign of old inflammation. The left ureter was normal. The left kidney was very large, but both to naked eye and microscopic examination the structure was normal, the enlargement being no doubt compensatory. The glistening particles which occurred in the fluid in the right kidney and ureter proved to be scales of cholesterin crystals, and the whitish flakes were chiefly composed of cholesterin, mixed up with what appeared to be epithelial *debris*.

The most remarkable appearance which the specimen presented has yet to be referred to. This is still well shown, as the kidney which is before the Section was preserved in one of the chrome fluids, and has undergone little or no change in aspect save for a darkening of colour. I refer to the peculiar shaggy appearance presented by the entire of the internal surface of the saccules of the kidney, and of the pelvis, and of the ureter, as far as it is pervious. On close examination with the naked eye, or better, with a simple lens, this roughening of the internal aspect of the organs is seen to be due to minute elevated lines running irregularly all over the surface and intersecting in all directions. This appearance I have not been able to find described anywhere in connection with any form of dilatation of the kidney, and I think it must certainly be rare. It is not presented by any museum specimens which I have seen. I have brought here to-night three other specimens from my own museum, exhibiting various degrees of obstructive dilatation of the kidney, but none of them exhibit any resemblance to the condition described. One presents considerable dilatation of a kidney, the secreting structure of which has been much contracted by ordinary gouty cirrhosis, in a man who suffered from stricture of the urethra. The second specimen is a good example of the changes in the urinary organs which supervene upon vesical calculus. The bladder is small and enormously thickened. It contained a rather large calculus. The ureters are widely and unequally dilated, ridged in parts, and in

parts constricted, and the right shows an almost perfect valve. The kidneys are dilated and sacculated—excellent examples of "surgical kidneys." These organs were removed from the body of a patient who died of uræmia immediately after I took charge of the Richmond Asylum.

The third specimen is the urinary organs of a male patient who died recently in the asylum of villous cancer of the bladder. The earliest symptom had been violent hæmorrhage from the bladder about a year and a half before death. Later on intense pain appeared, referred chiefly to the flanks and loins. The growth sprang from the trigone, and had obstructed the orifice of the left ureter, so that it was somewhat difficult to inject a stream of water from the ureter into the bladder. It had altogether blocked up the opening of the right ureter. It will be seen by the way that the right ureter is double, presenting this condition, that two distinct tubes arise, one above another, from the pelvis of the kidney, run quite separately for about half their way, then adhere, but form two separate channels almost the entire remainder of their course, and unite just outside the bladder by obliteration of their adjacent walls. The left kidney is in an early stage of sacculation, the right in a more marked condition of the same state.

Now all these three specimens show the same perfectly smooth condition of the internal surface of the kidney and also of the ureter. The ureter of the patient with the cirrhotic kidney shows a rugose condition of the whole thickness of the wall, but the mucous membrane itself is perfectly smooth. Similarly with the case of stone, though there are ridges and constrictions, and something approaching to valves, the mucous membrane retains its normal smoothness and glister. The smooth condition of the interior is mentioned in every description of the sacculated kidney or hydronephrotic kidney of obstruction which I have come across.

Under the microscope the walls of the hydronephrotic kidney which we are examining are seen to consist chiefly of adult connective tissue, showing here and there in every specimen examined tubuli uriniferi, and in some, distinct glomeruli. The tubuli are generally exceedingly small, and often have a hardly distinguishable lumen. The glomeruli, also, are highly degenerated. Both are often filled with a dense mass, staining deep red with carmine (colloid). The elements are arranged thus:—In the outer walls of the sacculi, forming the wall of the kidney, dense connective with a few elongated nuclei lies outside; within is a layer of connective fibres, among which are the remains of glandular tissue with frequent masses of small round cells. These masses run in bands parallel to the direction in which the fibres and tubuli run in the long axis of the sections made in a vertical plane. Internal to this layer, lies a layer of swollen-looking connective tissue fibrils, staining imperfectly or not at all in carmine or logwood, rising at irregular intervals in loose concentric loops which form the small ridges visible to the naked eye on the internal surface of the sacs. Scattered on the surface of these elevations, and gathered in little heaps between them, are granular-looking masses which stain a dirty yellow in carmine and a greyish tint in logwood, and which recall the masses of epithelial debris which we find in place of the tubuli in advanced cases of cirrhosis. From these heaps bands of a similar material, mixed, in some places, with small round cells, run down diagonally between the elevations to join the clusters of small cells in the lower layer.

Exactly the same conditions are found in the dissepiments between the various loculi. Here a broad band of white connective tissue, with few elastic fibrils, forms the central portion of the walls; the other layers occur on each side.

The thickened ureter shows on its surface a layer of swollen fibres rising into elevations, with epithelial or in-

flammatory debris accummulated between them, and thinly scattered on the surface.

The sections presented show all the appearances above described.

That the destruction of this kidney and its conversion into a sort of multilocular cyst, depended upon the closure of the right ureter at its opening into the bladder seems evident. I should say from the remains of secreting structure still to be found, that this closure occurred after the kidney had begun to functionate.

What gave rise to the closure of the ureter is not clear. Possibly it was due to gonorrhœal cystitis.

The peculiar roughened state of the internal surface of the ureter and kidney, together with the microscopic find, suggests a chronic inflammatory condition of the lining mucous membrane, but why this condition should arise in this particular case I am at a loss to say. The state of the ureters in the case of stone exhibited, seems to indicate that they were damaged by the passing of gravel or small calculi, yet their mucous membrane retains its smooth aspect.

DR. NIXON said that the first specimen shown corresponded exactly to the description of Raye. The complete absence of renal substance is very striking, as well as the appearance of the dilatation. The tissue looks like granulation tissue to the naked eye. The fusiform condition of the ureter is also interesting. Could the constrictions be due to irritation set up by delay of the stone in passing down the ureter.

DR. NORMAN said that this suggestion, as applied to the first case, was very ingenious.

MOVABLE KIDNEY.

By KENDAL FRANKS, M.D. Univ. Dubl.;
Fellow and Member of Council, R.C.S.; Surgeon to the Adelaide Hospital.

[Read in the Section of Pathology, January 13, 1893.]

FLOATING kidney is so seldom seen, either in the dissecting room or on an operating table, that I have frequently met with men who doubted its existence, and who seemed inclined to look upon it as one of the refuges for difficult diagnosis. I therefore think it may not be an unnecessary trespass on your time to lay the following case before you, and to offer some observations upon the subject of Movable Kidney in general:—

CASE.—Mrs. C., a postmistress, aged thirty-two, was sent up to me from the country on the 27th of September, 1892, with a request from the doctor, under whose care she had been, that I would do what I could for her. She had been married for thirteen years and had ten children, the youngest of whom was born last February. She dated her troubles from an attack of influenza in December, 1891, whilst she was *enceinte*. After she recovered from the influenza she suffered continuously from abdominal pains and attacks of sickness. Her confinement in February was normal; she got well rapidly and suffered from no after troubles whatever. The abdominal pains and sickness, which she had had since December, were unaffected by her delivery. She came up to Dublin for rest and change in April, and consulted Dr. Little. First he prescribed salicylate of bismuth and put her on a milk diet, and subsequently made her wear a binder round the body with a broad abdominal pad. This gave her great relief, but gradually the effect wore off—I presume as the binder got slack. When I saw her she complained of a constant dragging pain in the abdomen, which varied much in intensity, but was unaffected by the menstrual periods. When an acute attack came on, which very frequently occurred, the pain gradually got worse until it became agonising. This was followed always by sickness of the

stomach, vomiting lasting for some time. These attacks were uninfluenced by food. It made no difference whether the stomach were empty or full, except that the retching was less distressing, if she had anything in the stomach to bring up. No special kind of food or change of diet had any effect upon these paroxysmal attacks. When the pain came on she used to feel a lump in her right side. It seemed to her as if something contracted and formed a lump or lumps. These disappeared as soon as the pain stopped. I examined her lying down on a couch, and at once detected "the lump." It lay in the right side below the line joining the umbilicus to the right anterior superior spine of the ilium. It could easily be pushed upwards until it disappeared beneath the edge of the liver, where it appeared to occupy the normal position of the right kidney. It was smooth and elastic to the touch, and I thought I could feel the hilum. I had no doubt in my mind that I had to do with a case of movable kidney. She had no urinary trouble, and the urine, when examined, was practically normal. When compressed between the fingers, she at once said she experienced the same pain that she always did during a paroxysm. Examination of the rest of the abdomen revealed nothing abnormal, except that the stomach was evidently dilated. She was admitted to the Adelaide Hospital on September 28th. A couple of days later I examined her in bed with my colleague, Mr. Heuston. At first we could find no tumour, but when we put her sitting up in bed, and gave her a slight shake, the tumour at once appeared in the same position I had at first found it. When I first saw her she had been walking about town, so that the tumour lay in a convenient position for investigation, but after lying in bed for a couple of days it had gravitated into its normal position. From the sensation the tumour gave to the fingers, and from the severity of the pain she suffered, I believed we had not only to deal with a movable kidney, but also probably with one the seat of calculus. I therefore determined to open the abdomen, to examine the kidney; if healthy, to stitch it into its proper position, and if calculous, to excise it. I also believed that this exploration could be much more easily and much more thoroughly performed through an anterior than through a lumbar incision.

The operation was performed on October 4th, 1892. A vertical incision was made in the right linea semilunaris, about five inches in length, and the peritoneum opened. The kidney had fallen back into its normal position below and behind the liver, so that I had

to pass my hand up to this position and lift it out of its bed. It came readily forward, and at once confirmed the diagnosis of a floating kidney. It appeared a little more crimpled than usual, but otherwise normal, except for its surroundings. It was totally devoid of its usual fatty capsule, and instead of this was accurately covered all round with peritoneum. The peritoneum was reflected at the hilum on to the vessels and ureter until it reached the right side of the spine, when it became continuous with the posterior parietal layer. The kidney had thus a perfect mesonephron. The upper portion of the kidney at its internal border was firmly attached to the duodenum by a peritoneal band; by drawing the kidney downwards until it occupied the same position which it usually did in its wanderings, it became apparent that it so dragged upon the duodenum as in a great measure to kink it and so to close its lumen. This explains the dilated condition in which the stomach was found to be, and was evidently the cause of her gastric troubles. I then punctured the kidney in several situations and directions with an ordinary round sewing needle fixed in a handle, in order to satisfy myself as to whether it contained a calculus. Having found that there was no stone to be felt, I fixed it in the right side as nearly as possible in its normal position. The method I employed was this:—I passed a strong curved needle, armed with a stout silk ligature, through the posterior wall of the kidney first. The needle entered in the lower half, transfixing the peritoneal and fibrous capsule, and probably portion of the renal substance. It emerged in the upper half, about 1½ inches from the point of entrance, in a vertical line above it. Having drawn the silk through, I withdrew the needle. The upper end of the ligature was then threaded into the needle. With my left hand I encircled the tissues in the loin, so that with the thumb inside the abdomen, and the fingers externally at the back, below the 12th rib, I could feel that there was nothing between them than the posterior abdominal wall. I then transfixed the wall with the needle, bringing it out just below the 12th rib. A small incision was then made at this point in the back, through the skin, in order to be able to bury the knot of the ligature. The end of the silk being secured, the needle was withdrawn and threaded with the lower end of the ligature. The posterior abdominal wall was again transfixed, as nearly as possible about 1½ inches below where the first ligature entered, and was brought out through the small incision in the loin. The two ends of the liga-

ture were then firmly tied behind so as to fix the kidney in this position. The ends were then cut off and a single suture through the edges of the skin completely closed the wound over the knot. The abdominal wound was then rapidly closed, and the patient removed to bed. She made an uninterrupted recovery. She came to see me two months later. I could not then detect anything abnormal with the kidney. The silk ligature has given no trouble, and she has completely lost the dragging pain and the paroxysmal attacks from which she suffered. She is still troubled with indigestion and flatulency, but she has lost the sickness.

I have brought this case forward mainly because a true floating kidney—that is, a kidney with a well-defined mesonephron—is not very often met with at an abdominal operation, nor in the dissecting room, nor at an autopsy. In fact, this condition is so rare that some writers even doubt its existence. Thus, Sir Wm. Jenner says, in his Clinical Lectures on the Diagnosis of Extra-Pelvic Tumours of the Abdomen—"A movable kidney is one thing, a floating kidney is another. We very rarely see or feel a floating kidney. I have never met with one after death, though I have felt in a patient what has been supposed to be one." He does not, however, deny that such a condition may exist. Mr. Lawson Tait is more sceptical. In the *British Medical Journal* for Nov., 1882, in reference to a case "pronounced to be a 'floating kidney' by several distinguished authorities," but which proved at the time of operation to be a distended gall-bladder containing a large number of gall-stones, he said—"I put the floating kidney altogether on one side; besides, I have never seen such a thing, either in life or in a museum, nor have I met anyone who has. In fact, I have no belief in its existence as a pathological incident." This statement alone would warrant me in laying the above case before the Academy.

Newman's classification of displacements of the kidney is the most convenient. He divides them into three classes:—

1. Simple displacement, without mobility of the kidney.

2. "Movable kidney," where the organ is perceptibly mobile behind the peritoneum.

3. "Floating kidney," where the peritoneum forms a mesonephron which attaches the kidney loosely to the spine.

Simple displacement without mobility is congenital and by no means uncommon, and may exist without causing any disturbance. Newman found that in 1,000 *post-mortem* examinations 24 cases occurred where the position of one or both kidneys might be described as distinctly abnormal. In 9 of these cases there was also malposition of the supra-renal capsule. Roberts states that in 21 cases which he was able to collect and compare, the abnormality was in every instance confined to one kidney, and the *left* kidney was much more commonly affected than the right (left, 15; right, 6). In these cases of simple displacement the renal artery is abnormally long, and the renal vein enters the nearest large venous trunk. The kidney is never found in the epigastrium or the hypochondriac regions. It may be found transversely behind the umbilicus, in front of the vertebral column, in the iliac fossa, on the sacro-iliac synchondrosis. M. Aubé has found it between the common iliac arteries, close to their origin from the aorta; and Pacoud describes a case in which a kidney was found in the pelvis between the rectum and bladder. Whatever position the kidney occupies, it is fixed there.

In *movable kidney* the organ is mobile behind the peritoneum, either within its adipose capsule, or in a sac formed between the peritoneum and the muscular wall of the abdomen.

It is an acquired condition, and may appear first at puberty, but usually is discovered between the ages of twenty and sixty. About 81 per cent. occur between twenty and fifty.[a]

[a] Newman, Surgical Diseases of the Kidneys. 1888. P. 27

It is not unknown among children; Steiner[a] found it three times in children aged respectively six, nine, and ten years; Kepler[b] saw it in a little girl of nine; and Hirschsprung[c] in two cases—one a boy of seven, and the other a girl aged eight years; but movable kidney in children is quite exceptional.

Movable kidney, though of much more frequent occurrence than the floating variety, is nevertheless *pathologically* rare. In over 11,000 autopsies in three hospitals, quoted by Newman, only 11 cases were found, or only 1 in 1,000. In the Klinik of Oppolzer, given in Rollet's statistics, there were 22 cases in 5,500 autopsies, or 1 in 250; Ebstein states that in 3,658 *post-mortem* examinations in the Charité Hospital at Berlin, a movable kidney was found only 5 times, or once in 731 autopsies.

Clinically however, we recognise that mobility of the kidney is much more common. I have seen four or five cases in which I had no doubt about the diagnosis, but in which the mobility of the kidney gave rise to no symptoms, and therefore the diagnosis could not be verified. The case I have recorded was one of floating kidney, and at the operation the diagnosis was proved correct. Skorczewsky[d] states that in 1,422 patients whom he examined during life, 32 females out of 1,030, and 3 males out of 392, were the subjects of mobility of kidney. Amongst the poor of Austria, according to Oser of Vienna, 10 per cent. of the women who have borne children are affected.

Now, the discrepancy between the pathological and clinical statistics may be attributed, of course, to faulty diagnosis. But I think it may be accounted for otherwise. In autopsies, and in abdominal operations, the subject occupies the dorsal

[a] Compend. der Kinderkr. Leipzig. 1872. P. 314.
[b] Archiv. für klin. Chirurg. 1879.
[c] Hospitals-Tidende. 1879. T. VI., p. 48.
[d] Morris. Diseases of the Kidney. 1885. P. 27.

position, which favours the return of the kidney to its normal situation. Hence, unless attention is specially drawn to the organ, its power of mobility is likely to escape detection. Again, as noticed by Newman,[a] "the adipose tissue around the kidney becomes firm after death, so that even in a case where the kidney was movable during life, it might become so fixed after death as to escape observation."

There are two features about movable kidney which are particularly striking. First, the relative frequency of the condition in women as compared to men; and secondly, the relative frequency of the right side over the left.

The proportion of women affected with movable kidney as compared with men is very great. Thus, in 64 cases in Lancereaux's table, there were 55 women to 9 men. In a table of 249 cases compiled by Dr. A. W. Foot,[b] there were 215 women to 34 men. Both of these give a proportion of about 6 women to one man. In the 290 cases collected by Newman, the sex is given. Of these 252 were women and 38 men—a proportion of 1 to 6·6. In Keen's table of cases of nephrorrhaphy[c] for movable kidney, the sex is reported in 99 cases. Of these 93 were women and 6 men—a proportion of 15·5 to 1. The excessive proportion in Keen's table would seem to indicate that women either suffer more from a movable kidney than men, or that they are more ready to submit to an operation for relief.

In considering the relative frequency of mobility of the two kidneys, it is remarkable how much more common it is on the right than on the left side. Ebstein gives 4·5 to 1 as the ratio; but this seems too small. In Landau's tables[d] he found movable kidney 151 times on the right to 13 on the left—a proportion of 11·6 to 1. Fourteen times he

[a] Loc. cit. P. 30.
[b] Dub. Med. Journal. 1881. Vol. I. P. 386.
[c] Trans. Amer. Surgical Assoc. 1890. P. 197.
[d] Archiv. für. klin. Chirurgie. 1879.

found it bilateral. In Keen's tables of nephrorrhaphy the side is reported in 87 cases; of these 76 were right and 7 left—a proportion of very nearly 11 to 1. He found it on both sides in four cases.

Considerable diversity of opinion exists as to the causes of movable kidney. Cruveilhier attributes it to the pressure exerted upon the liver by stays, this transmitted pressure driving the kidney out of its normal situation. This, however, will not explain its occurrence in men, nor in those women who do not wear tight stays. Lancereaux calls attention to the physiological and pathological relation between the kidneys and the generative organs to explain its occurrence. Gutfmann[a] calls attention to the congestion of the kidneys which accompanies the menstrual epochs. These organs tumefy, become heavier, and have a tendency to leave their normal position and to descend little by little into the abdomen. But even in women this will not always explain the occurrence of renal mobility—as, for instance, in the case reported by Guyon,[b] where a movable kidney, accompanied by acute pain, appeared for the first time in a woman aged fifty-four, a year after the menopause. Landau attributes the different behaviour of the right and left kidney to the difference in their mode of attachment, to the difference between the hepatic and the splenic flexures of the colon, to the position of the left renal vessels above the horizontal part of the duodenum, to the shortness of the left renal artery, and to the extra support the left kidney gets from the attachment of its vessels to the pancreas.

Newman[c] offers the following explanation:—"The posterior surface of the right kidney is practically in contact with the crura of the diaphragm and the great lumbar muscles, while

[a] Traité du Diagnostic. P. 444.
[b] Journal de Méd. et de Chirurgie Pratiques. 1888. P. 441.
[c] Loc. cit. P. 36.

interposed between its anterior surface and the anterior abdominal wall there is a large solid organ—the liver. Now, suppose the patient strains the abdominal muscles, as during delivery, or in lifting a heavy weight, both the anterior and posterior abdominal muscles are brought into powerful action, the liver being pressed backwards by the anterior muscles, the kidney pressed downwards by the crura of the diaphragm, and forwards by the posterior abdominal muscles. Now, the resultant of these forces will act in a manner similar to what takes place when one presses a bean between the finger and thumb—that is to say, the kidney will be pressed downwards."

I do not think, however, that we can accept this as the solution. No doubt women experience great abdominal strain during delivery; but in lifting heavy weights, and in work involving severe strains on the abdominal muscles, men are much more liable to injury than women. If this were the cause of mobility in the kidney we should find it much more commonly in men than we do, and perhaps even more frequently in men than in women. But this mechanical theory of Newman's might be accepted as a good working theory if the liver were a solid body—that is, if in the living body it were as solid an organ as it appears to be on the dissecting-room table; but we know it is not, and, as Professor Cunningham has pointed out to me, the very pressure which Newman thinks would tend to drive the kidney downwards would in reality only help to bury it the deeper in the under-surface of the liver.

Now, in seeking for a cause which will satisfy the majority of cases of movable kidney, we must bear a few facts in mind which will also, I think, help us to a proper solution. In the first place, movable kidney is much more common among women. Secondly, it is found mostly in women who have borne large families, and who have had their

children in rapid succession; it occurs in the large majority of women during the child-bearing period—81 per cent. between the ages of twenty and fifty. Thirdly, it is generally found in women who, from some cause or other, such as repeated pregnancies, have emaciated rapidly. Fourthly, it is found much more frequently on the right than on the left side. Now, the explanation of this last circumstance, I think, may be explained on purely anatomical grounds. Besides the considerations already alluded to, which Landau holds sufficient to account for mobility on the right side, we may remember the position of the pancreas, which practically binds down the left kidney, and renders its dislocation much more unlikely than on the right side. The other facts I have mentioned clearly indicate a close relationship between frequent pregnancies and movable kidney, when occurring in women, as the main factor in producing the latter. Whatever influence the position and shape of the liver, under ordinary circumstances, may have, as believed by Newman, we must bear in mind that the shape of the liver and its relations are materially altered during pregnancy. It is then mainly composed of an upper and under surface, its anterior and posterior surfaces being reduced to very small proportions. The kidney then is almost unprotected by it, and protrudes below it to a much greater extent than in the normal condition. What influence this may have in facilitating displacement has still to be worked out. In any case, however, the sudden removal of the intra-abdominal pressure following on parturition leaves the kidney, as well as other organs, suddenly deprived of their accustomed support. In the upper and middle classes of society women usually retain the recumbent position for some time after delivery—long enough to allow the abdominal walls to regain their firmness and elasticity. But among the poorer classes this is not the case; they leave their beds at an

earlier period, while the parts are still lax, and a binder is but imperfectly applied. The result is that every opportunity is afforded to the internal organs to become displaced, and hence we find that movable kidney among the poorer classes is much more frequent than among the rich. Thus Newman* writes:—"The great majority of the patients whom I have seen suffering from these diseases were poor, and had been subjected to the conditions just mentioned. In many instances the pregnancies succeeded one another so rapidly that the mother had no time to recover between these periods, and consequently progressive emaciation resulted. In such cases the peritoneum becomes stretched and flaccid, its union with the posterior abdominal wall loosened, and by the flaccid condition of the anterior abdominal muscles, pendulous belly ensued; the intra-abdominal pressure was thereby reduced, and so the kidneys practically came to be suspended by their anatomical attachments, which were rendered unable to fulfil their function properly." In the twenty-one cases observed by Newman, nineteen were females, ten of whom had borne large families, and six suffered from pendulous abdomen. In A. W. Foot's monograph on the subject he mentions four cases of movable kidney which he had met with (without specially looking for it), all in women. Three were married and had borne children.

In women who have not borne children, and in men, we must seek for other causes of movable kidney. "A cause which seems to operate in many cases, and which is applicable to either sex, is a different and simpler modification in the anatomical arrangements of their surrounding parts [than the possession of a mesonephron], by which the kidneys may be rendered movable to a considerable extent—namely, the removal of the peri-renal fat in the progress of emaciat-

* Op. cit. P. 27.

ing diseases, such as phthisis, or from less obvious reasons."[a] Riolan,[b] quoted by Foot, pointed out two hundred years ago the disappearance of the peri-renal fat as the cause of movable kidney. In 1857 Oppolzer noticed that in these cases the kidneys, when examined after death from other causes, were found to be healthy, but "there has been observable a deficiency in the cushion of fat and a lengthening of the renal vessels."

"There is little doubt," writes Newman,[c] "that an absorption of the fat surrounding the kidney will render the tunica adiposa more lax, and loosen the attachments of the organ, stretch the renal vessels, and permit undue freedom of movement and prominence of the kidney."

Traumatisms occasionally are responsible for dislocating a kidney from its normal situation. A very interesting example was laid before the Medical Society of the College of Physicians of Ireland, in 1874, by Dr. W. B. Peebles.[d] A young married lady had a phaeton turned over upon her by a runaway horse. She was found underneath it, on her right side, insensible. She was kept in the horizontal position for a month. Two days after she was allowed up she was seized with symptoms of acute nephritis. Shortly afterwards she discovered what she called a "gizzard" loose in the abdomen, following the movements of the body. When it was near the stomach food passed in seemed to strike against it. When the upright position was assumed it fell downwards. It was tossed about by the movements of flatus in the bowels. There was "great agony" accompanying all these movements. The diagnosis made by those who saw her was a displaced kidney. It seemed probable that the edge of the vehicle, resting directly on the left side of the loin, had con-

[a] A. W. Foot. Loc. cit. P. 389.
[b] Manuel Anatomique et Pathologique Lyon. 1682. P. 288.
[c] Loc. cit. P. 29.
[d] Dub. Med. Journal. 1874. Vol. LVII., p. 338.

tused the deep parts against the spine, while a good deal of clothing and the cushion had saved the skin; that the kidney was then loosened in its bed, and that it dropped out afterwards when the upright position had been assumed. The diagnosis was confirmed a month later when suppuration occurred in the tumour, and was discharged with the urine per urethram. Recovery was subsequently complete.

At the same meeting of the Medical Society, Dr. Gerald Yeo related the case of a labouring man, aged forty-five, who had recovered from serious injuries caused by a cart passing over his loins. A year and a half after the accident his left kidney could be displaced by manipulation over the margin of the quadratus muscle, and could be seized through the abdominal wall as it lay under the ribs.

Morris[a] quotes from Henoch the case of a military officer who fell upon his feet from a horse, and suffered a violent concussion of his entire body; subsequently both his kidneys became movable.

The various causes enumerated above apply only to movable kidney. Floating kidney is essentially a congenital condition. The description I have given of it, as found in the case I have reported, is sufficiently characteristic. It may remain unobserved for years, giving rise to no symptoms, and some accident may be the first thing to call attention to its existence. I think it is highly probable that while the pedicle is short it may give rise to no inconvenience, but when as the result of hard work, or of repeated pregnancies, the mesonephron with its interposed blood-vessels becomes elongated, it begins to drag upon contiguous structures—as, for instance, upon the duodenum, and so gives rise to symptoms often of an acute character, which lead to its detection. Thus a floating kidney, like a movable kidney, may escape detection for years. Until the abdominal cavity

[a] Surgical Diseases of the Kidneys. 1885. P. 30.

is opened it is impossible to distinguish between the two forms. It is supposed by some that in the true floating variety there is a greater freedom of motion than in the movable, but this is not the case. In the latter variety, occasionally, "owing to the flaccidity of the peritoneum, the degree of mobility is as considerable as though the kidney possessed a long and loose mesonephron."[a] In the Report of the Committee of the Pathological Society of London,[b] Dr. Bindley's case is mentioned, in which the kidney was able to move under the peritoneum over a space described as a circle having a diameter of eight or nine inches. Thus a movable kidney may fall as low as the brim of the pelvis, or may lie immediately beneath the anterior abdominal wall, or may cross the spinal column to the opposite side. From a surgical point of view, there is an important difference between these two varieties of renal displacement. In the floating variety it is impossible to reach the kidney without opening the peritoneum, whilst the movable kidney can generally be reached from the loin without in any way injuring this membrane. But from a clinical and diagnostic standpoint, the two varieties are indistinguishable. Therefore, in referring to the symptoms produced by movable kidney, it will be understood that the same reference applies to floating kidney also.

In a large number of cases movable kidney gives rise to no symptoms whatever. In such cases the pressure of the mobile tumour is accidentally discovered by the patient or by the medical man whom she consults for some other ailment. The nature of the tumour is made out then by the physical signs and by the history of the case. The tumour generally presents the outlines of the kidney. The hilum may be felt. It is firm, smooth, and generally insensible, or

[a] Morris. Loc. cit. P. 26.

[b] Transactions Pathological Society of London. Vol. XXVII., p. 473.

very slightly sensible to pressure. It is for the most part painless. Sometimes, however, a dull, dragging pain is experienced, or it may come on in severe paroxysms resembling renal colic; if the kidney is then pressed upon or manipulated, a sickening sensation or a "fainting pain" is experienced, which is very characteristic. The tumour, which can be moved freely about, can in general be made to disappear into the hollow of the loin, into the normal situation of the kidney; this sign is almost pathognomonic of movable kidney. It is also possible sometimes not only to make out the shape of the kidney and the hilum, but to recognise the pulsation of the renal artery as it enters the concave border. I have had for twelve years a patient under observation, who possesses a freely movable kidney on the left side, which produces no symptoms or inconvenience whatever. The kidney can be freely moved about even across the middle line and down to the line joining the anterior superior spine to the umbilicus. The shape can be easily mapped and the pulsations of the renal artery at the hilum are perfectly distinct and easily felt. In general, when the kidney is displaced, a depression can be recognised in the loin in the position usually occupied by the kidney. Percussion is unreliable, as it is impossible to eliminate the coils of intestine which may lie in front of the kidney, and which may give a clear note.

In the majority of cases it is true that movable kidney gives rise to little or no trouble, but in some, at any rate, it may become a source of great discomfort or danger. Thus Keen[a] writes:—"The discomforts are very great, and the pain may be so excessively severe and prolonged as to interfere with all occupation, and practically to make life almost unendurable. . . . The disorder may pass beyond the realm of bearable evils into serious and actual danger to life

[a] Transactions American Surgical Association. 1890. Vol. VIII., p. 184.

itself, so that in considering the slight mortality from nephrorrhaphy, we must also bear in mind that there is a mortality attending the expectant treatment as well." Professor Le Dentu,[a] of Paris, says:—"The suffering is sometimes so acute, that life becomes nothing but an endless torture."

These severer symptoms are many and various. The most frequent of these have reference to the stomach. There may simply be gastralgia and dyspepsia, accompanied by a dragging pain and sensation of weight in the affected side of the abdomen. The gastric disturbances may become severe and acute, as in my patient. The pain steadily increases until it becomes intolerable and agonising. Vomiting frequently follows, either of food recently taken or of a green-looking fluid. M. Mathieu[b] recently stated at the Société Médicale des Hôpitaux that he had observed some patients in whom there had been very severe attacks of vomiting some ten or twelve times a day for a fortnight or even more. There was a strong resemblance to some of the gastric crises of locomotor ataxy. There was severe abdominal pain, and in a few cases such gastric dilatation as to suggest a temporary constriction of the pylorus.

Many theories have been offered to explain the occurrence of these gastric crises. Bartels[c] considered that where the right kidney was displaced and came in contact with the second portion of the duodenum, the compression might be sufficiently strong to cause dilatation of the stomach. This is the view M. Mathieu[d] adopted at the meeting of the Société Méd. des Hôpitaux, and M. Legendre supported him in the discussion.

Newman[e] does not believe that these symptoms are caused

[a] Surgical Affections of the Kidneys and Urethra. 1889. P. 581.
[b] Le Progrès Méd. Oct. 29, 1892.
[c] Journal de Médecine et de Chirurgie Pratiques. 1884. T. LV., p. 394.
[d] Op. cit.
[e] Loc cit. P. 39.

simply by direct pressure, "for we know that large tumours may exist and move freely within the abdominal cavity without causing much reflex disturbance; it is more probable that they are due to dragging upon the renal vessels and nerves."

Morris* declares that these gastric crises are caused "by the dragging or pressure of the kidney upon the middle portion of the duodenum."

Now in the case I have reported, I think, we find the simplest explanation of these gastric crises. It may not, of course, be universally true. It may be possible for the kidney to roll over on to the middle portion of the duodenum, and so compress it; but anatomically this is not likely. When we remember the intimate connection between the under-surface of the liver and this portion of the duodenum, it is difficult to understand how the kidney could insinuate itself between the two, in order to compress the latter. But there may be, as my case shows, a sufficient connection between the duodenum and the kidney, so that every movement of the latter more or less influences the former. A slight degree of traction would probably affect the duodenum inappreciably, but when the kidney descends as low as I found it—that is, below the level of the umbilicus in front—it drags the vertical portion of the duodenum with it, and so causes it to kink at the angle where the first joins the second portion, and thus more or less completely occludes it. This condition was clearly demonstrated in the case I have reported. It is easy, when such a condition holds, to understand the severe gastric crises which may ensue, and which disappear as "the lump" sinks back into its normal position.

The same dragging or pressure on the vertical portion of the duodenum will explain in most cases another symptom which occasionally is found in movable kidney—namely, the

* Loc. cit. P. 31.

occurrence of jaundice. Were the traction or the pressure sufficiently great to close the intestine it would easily follow that the common bile duct would easily share in the obstruction. That jaundice is less frequent, certainly not as common as the gastric disturbances, would follow as a matter of course, for it would require but a comparatively short period of obstruction in the duodenum to induce severe gastric symptoms, whilst jaundice would only follow on a prolonged obstruction of the bile duct.

Newman[a] attributes the jaundice, in a case observed by him, to catarrh of the bile duct, or to gall-stone; and Lindner[b] supposes it to be due to reflex spasmodic stricture of the biliary ducts.

In addition to the symptoms enumerated above, there are other symptoms which call for mention—such as neuralgia in the loins, starting down the thigh or along the groin of the affected side. Defontaine has reported the case of a patient in whom pressure over the displaced kidney occasioned an immediate echo at the meatus and a sense of weight in the scrotum; and Professor Le Dentu mentions the case of a lady who complained of a sensation at the neck of the bladder the moment he laid his hand over the site of a dislocated kidney. For diagnostic purposes it is well to bear in mind another characteristic of the sufferings induced by movable kidney. In a large number of cases the symptoms become more accentuated and severe immediately before and during the catamenial periods.

Hydro-nephrosis is not an infrequent complication of movable kidney. "When the kidney drops forward or downwards, as after long standing or sitting, the course of the ureter becomes so deflected and curved upon itself that the urine cannot flow along it; and this temporary obstruction,

[a] Op. loc. cit. P. 39.
[b] Deutsche med. Wochensch. 1884. No. 15.

frequently repeated, leads at length to a permanently distended state of the renal pelvis."[a] Thus what at first may lead only to temporary or intermittent hydro-nephrosis may ultimately result in serious disorganisation of the renal structure itself. In Newman's 21 cases, he found intermittent hydro-nephrosis in 4, and albuminuria in 5.

Knowsley Thornton[b] reports a case of double hydro-nephrosis due to mobility of the kidneys, and states that torsion of the ureter may give rise to uræmia.

This rotatory power of the kidney in its mobile state may not only obstruct the ureter, but may produce torsion of the vessels. The symptoms accompanying this latter condition resemble those which indicate torsion of the ureter, in the sudden diminution in the quantity of urine, the renal pain, the vomiting, the persistent headache, and even uræmic symptoms; but in torsion of the vessels, as the blood flowing through the kidney is shut off, there is no increase in the size of the kidney by retained secretion. The flow of urine which succeeds replacement of the kidney in its normal position is copious; but it is of a high specific gravity, instead of low, as from a transitory hydro-nephrosis (Newman).

In the majority of cases of wandering kidney the diagnosis can be easily arrived at. A tumour of the shape and consistency of a kidney, which can be pushed easily from below upwards, and made to disappear completely into the lumbar region, is sufficiently characteristic. When its reducibility is, however, not complete, the diagnosis is not so easy, and the tumour may be easily confounded with a tumour of the liver, of the spleen, of the ovary, or, more frequently still, of the mesentery. A kidney which has been mobile for a length of time may, owing to the pressure or traction which

[a] Morris. Surg. Diseases of the Kidney. 1885. P. 82.
[b] Surgery of the Kidneys.

it exerts upon neighbouring structures, set up inflammatory action, which leads to the formation of adhesions, and consequently changes the movable into a fixed displaced kidney. In such cases much assistance in the diagnosis may be obtained by a careful attention to the previous history. But even in movable kidney mistakes have been made. Dr. A. W. Foot,[a] in his admirable paper on the subject, quotes the case of a woman in whom attempts had been made to restrain the motion in a floating kidney by passing a tape seton through the walls of the abdomen and the tumour. "Some hæmaturia was noticed after the operation. After three months the seton broke and came away. Four years after, the kidney was removed successfully; the organ was found in the umbilical region; a deep cicatrix, about two and a half inches long, marked the track of the seton. The patient was an Irishwoman, aged thirty-five. She had been eight years affected with a pain and tumour in the right side, and, the report says, she had undergone 'the usual operation for ovarian tumour without removing the cause of her trouble.'" Prescott Hewitt relates the case of a woman, aged seventy-three, in whom a hard tumour, the size of the fist, lying in the right iliac fossa, had, on three separate occasions, been detected by medical men. Although the patient had for several years before her death passed bloody urine, alkaline and full of mucus, the diagnosis was made of a fæcal accumulation. At the autopsy, the tumour was discovered to be a movable kidney, containing one large and two small stones in its pelvis.

In Keen's tables of nephrorrhaphy there are two cases in which a distended gall bladder was present as well as a movable kidney. In one of them, Méar's case, the movable kidney was found through the lumbar incision, and stitched into position, and then cholecystotomy was performed, and

[a] Loc. cit. P. 393.

the opening in the gall bladder stitched below the kidney in the lumbar wound. In the other, Tischendorf's case, the mobile kidney was discovered during the operation for gall-stones. Mr. Lawson Tait[a] has published a case of distended gall bladder upon which he successfully operated, but which had been diagnosed as a floating kidney "by several distinguished authorities."

M'Cosh[b] relates two cases in which dilatation of the uterine cavity and removal of the ovaries had been the preliminary and ineffectual methods of relieving a woman of symptoms which entirely disappeared after the performance of nephrorrhaphy.

The treatment of movable kidney will depend upon the nature of the case we have to deal with. In the large number of cases which present no symptoms, in which the mobility of the kidney has, perhaps, been discovered by accident, it will be unnecessary to do more than to advise the patient to wear a binder. An elastic belt to support the abdomen will generally suffice. In some cases, where the symptoms are not sufficiently acute to require operative interference, or where, for other reasons, an operation is contra-indicated, it may be necessary to afford greater support to the kidney. The most serviceable, and, at the same time, the least disagreeable apparatus is a wide, elastic belt, supplied with an india-rubber pad, to lie over the region of the kidney, and which can be distended by insufflation, as required by the circumstances of the case.

In some cases, however, the symptoms are very severe, and no relief is obtained by any external support—indeed, sometimes pressure seems to increase the patient's sufferings; or, again, the conditions required to obtain relief may be so elaborate and irksome as to render life miserable;

[a] Brit. Med. Journ. Nov. 18, 1882.
[b] New York Med. Journ. March 15, 1890.

then it becomes the duty of the surgeon to consider what means his art can supply to relieve the distress and to cure the patient. The first attempt to deal radically with this condition was in 1878, when Martin, of Berlin, performed the first nephrectomy for a painful movable kidney. Since then the operation has been performed a sufficient number of times to enable us to estimate its value. Lindner[a] has collected 36 cases of excision for movable kidney, of which 9 died, a mortality of 25 per cent. Newman[b] gives a table of 30 nephrectomies for this ailment, of which 9 died, a mortality of 30 per cent. He observes that in 17 cases the excised kidney was normal. These statistics show that, as regards risk to life, nephrectomy possesses a bad record. It is far more dangerous than nephrorrhaphy, as will appear when we consider this operation. Nephrectomy has the disadvantage, moreover, of removing what may be, and very frequently is, a perfectly sound organ; at the same time, the other, or fixed, kidney may be disorganised. In certain cases, excision of the kidney may be justifiable, and even necessary. If, for instance, the movable kidney is at the same time diseased, and, perhaps, useless, or if it be impossible to push it back into its proper position in the loin, or if nephrorrhaphy have been attempted and has failed, removal of the organ may be the only resource left to us.

Three years after Martin had first performed nephrectomy for movable kidney, Hahn[c] published his first two cases of nephrorrhaphy, or fixing the kidney into its proper position by means of sutures. Since then this operation has been done a number of times, and has almost entirely, except under special conditions, superseded the operation of excision, on account of the successful results obtained, the small

[a] Wanderniere der Frauen. P. 45.

[b] Loc. cit. P. 65.

[c] Centralblatt für Chirurgie. July 23, 1881.

death-rate attending it, and because it retains for the patient the use of an important organ.

In order to reach the kidney, with the object of suturing it into its normal position, two methods may be adopted. First, it may be reached through the lumbar incision—that is, an incision beginning over the outer edge of the erector spinæ muscle, immediately below the twelfth rib, and extending obliquely downwards and forwards for about four inches. Secondly, the kidney may be approached from the front through a vertical incision in the linea semilunaris, as recommended by Langenbuch. The former is generally to be preferred, as in most cases of mobile kidney the organ can be found and sutured in position without opening the peritoneum. In cases of floating kidney, however, as the kidney possesses a mesentery and lies within the peritoneal cavity, it cannot be dealt with without incising the peritoneum. It matters very little whether this serous cavity is opened in front or behind, but the anterior method has the advantage of allowing a more thorough examination of the affected kidney to be made, and in case it be diseased, to discover the condition of the other organ as well.

Four methods have been employed for fixing the kidney in the loin.

M'Cosh[a] thus summarises them :—

1. The sutures may be passed through the adipose capsule alone.

2. They may be passed through the fibrous capsule of the kidney itself.

3. They may be passed through the parenchyma of the kidney.

4. The fibrous capsule may be partially stripped off the kidney in order to obtain a raw surface of renal tissue, by means of which the adhesions, it is believed, would be firmer.

[a] New York Med. Journal. March 15, 1890. P. 281.

The sutures are then passed through the parenchyma and capsule, just inside the border of the raw surface. This is the method recommended by Jordan Lloyd.

Of these various methods it would appear that the best results are obtained when the parenchyma of the kidney is included in the suture, or when the capsule is partially stripped off.

Of the material for suture, catgut has been practically discarded on account of its becoming absorbed before the adhesions have become sufficiently strong to retain the kidney *in situ*. Kangaroo tendon has been proved reliable in the hands of Gould and Morris. Aseptic boiled silk has been used by Keen in his cases, and "it has answered admirably."

Tillmanns,[a] who always passes the sutures through the kidney substance itself, employs both silk and catgut. He incises the capsule, and strips it partially off the renal substance. The free edges of the capsule are sutured to the wound in the loin by one catgut and one silk suture, and then a second catgut and a second silk suture penetrate the parenchyma of the kidney and secure it to the wound. These sutures through the perenchyma do not seem to cause any trouble. Occasionally a little blood is noticed in the urine for a few days, but it soon disappears. Tillmanns objects to the use of silkworm gut, as it cuts through the tissues too quickly, and thus after its use a return of mobility is facilitated.

The wound in the loin is generally healed in eight to ten days; but it is advisable to keep the patient in bed in the horizontal position for a much longer period—about six or seven weeks—so as to afford time for the adhesions to become firm.

By these means a complete cure can be obtained, and the

[a] Deutsche Zeitschrift für Chirurgie. Band 34. 1892. P. 628.

kidney be firmly secured into its normal position. An interesting case in point is published by von Langenbuch.[a] Some months after the performance of nephrorrhaphy for a movable kidney, the patient slipped down some steps, and in consequence of this accident the kidney was apparently again displaced. Upon opening up the original incision, von Langenbuch found that the kidney, which had been fixed in position by four silk sutures, was so firmly retained *in situ* that it had not been displaced by the accident, but the tumour which was found was the displaced lobe of the liver.

The mortality attending nephrorrhaphy is exceedingly small. In 134 cases collected by Keen[b], four died, giving a death-rate of 2·98 per cent. The causes of death in these four cases were—

1st. Ceccherelli's case, in which he resected the eleventh and twelfth ribs in order to get more room, and in so doing wounded the pleura. The patient died in forty-five hours of atelectasis and pleural effusion.

2nd. Hahn's case, where death was due to an unrelieved ileus, and not to the operation.

3rd. Von Langenbuch's case, in which one of the stitches passed through an old embolic infarct in the kidney, which caused death from septicæmia in three days.

4th. Lawson Tait's case, where death resulted from suppuration, presumably the result of the operation.

In reference to this last case, Keen writes:—"Mr. Tait has operated upon but three cases, one of which, he writes me, ultimately died from the suppuration following the operation, and the others were not benefited in the least; and he declares (*British Med. Journal*, Nov. 16, 1889) that he will have nothing more to do with the fixation of the kidney."

[a] Deutsche med. Wochenschrift. 1889. Band XV., s. 16.

[b] Loc. cit. P. 196.

Tillmanns[a] has operated sixteen times by nephrorrhaphy. Of these one died fifty-two days later of concurrent pulmonary phthisis, and death was in no way due to the operation. All the others recovered.

It thus appears that, as regards risk to life, nephrorrhaphy may be regarded as safe an operation as any in surgery.

As regards the results obtained, Tillmanns' cases have the advantage, from a statistical point of view, of having been all performed by the one surgeon. He has been able to follow twelve out of the sixteen cases closely. Of these twelve, six cases were found to have been completely and permanently cured when examined at periods varying from one to three years after the operation. Of the six remaining cases one died of phthisis forty-five days after the operation, and at the autopsy the wandering kidney was found to have contracted firm adhesions to the loin. In three cases no displacement of the kidney was subsequently discovered, but symptoms of "traumatic neurosis" continued. In two cases the kidneys relapsed into their mobile condition. Tillmanns explains these relapses, one being due to the use of silkworm gut, which cut through the tissues too rapidly; the other to the fact that the patient returned too soon to her work, before the adhesions could have become firm.

In Keen's tables of 134 cases, of which sufficient details were given in 121, there were, after three months, 52 per cent. cured, 17·3 per cent. improved, and 15·7 per cent. were failures.

Mr. M'Ardle said that in operations for a movable kidney it was often better to operate by making an incision in the anterior abdominal wall.

[a] Loc. cit. P. 650.

EXCEPTIONS TO THE TYPE OF EXTRA-CAPSULAR FRACTURE OF THE NECK OF THE THIGH BONE.

By E. H. BENNETT, M.D., F.R.C.S.;
Professor of Surgery, University of Dublin;
Surgeon to Sir P. Dun's Hospital.

[Read in the Section of Pathology, February 17, 1893.]

MANY writers apply the term typical to this fracture because its site in the thigh bone, its pattern, and the injury which causes it are almost constantly the same. I read in one of our newest text-books:—"Extra-capsular fracture is produced by the application of great and direct violence to the trochanter major, as from a fall laterally upon the hip."[a] Mr. Erichsen writes:—"It is the result of the application of great and direct violence upon the hip."[b] I could quote many authors to the same effect.

Force of the kind described in these passages will produce the fracture in the dead body as well as in the living; and the fracture in this respect contrasts with the intra-capsular which is most difficult, some say impossible, to produce experimentally. This constancy of cause furnishes a valuable help in the diagnosis of the varieties of fracture of the neck of the thigh bone. There are, however, exceptions to it which, though rare, I think we must not disregard.

I prefer the statement of the case given by Hamilton to the rigid rule laid down in the passages I have quoted. He says:—"Fractures without the capsule seem to be the

[a] Fractures and Dislocations. By T. P. Pick. P. 245.
[b] Science and Art of Surgery. Vol. I., 335.

result generally of falls or of blows received directly upon the trochanter; occasionally, also, they are produced by falls upon the feet or upon the knees."

We must be prepared to go even further, and admit that the fracture, typical in all other details, may result from muscular action, without any fall or blow.

Sir Astley Cooper's first illustration (Plate I.) of extra-capsular fracture seems to be forgotten by many more modern writers—"Mary Clements, aged eighty-three and a half years, when walking across her room, October 1st, 1820, supported by her stick, which from debility consequent upon old age she was obliged to employ, accidentally placed her stick in a hole of the floor, by which, losing her balance, and tottering to recover herself from falling, which she would have done but for those near her, she found she had, as she supposed, dislocated her thigh bone. . . . She ultimately sank, without any symptom of active disease, about fifteen months from the period at which the fracture took place."[a]

A vertical section of the specimen furnishes Cooper's first illustration of extra-capsular fracture of the ordinary variety with impaction of the neck into the trochanteric region of the bone with fractures of both trochanters which have united by bone. It is clear, then, that unless we ignore the very detailed account of the accident in this case, the typical fracture can result from muscular action without fall or blow on the great trochanter.

Some years ago a great gale blew over Dublin, and was at its height in the forenoon. In Fitzwilliam-square a man was blown by a sudden gust across the roadway, and against the railings of the square, and had his leg broken. At the same time an elderly woman was blown off the uppermost

[a] On Dislocations and Fractures of the Joints. By Sir Astley Cooper, Bart., F.R.S., &c. New Edition by Bransby Cooper, F.R.S. Page 167.

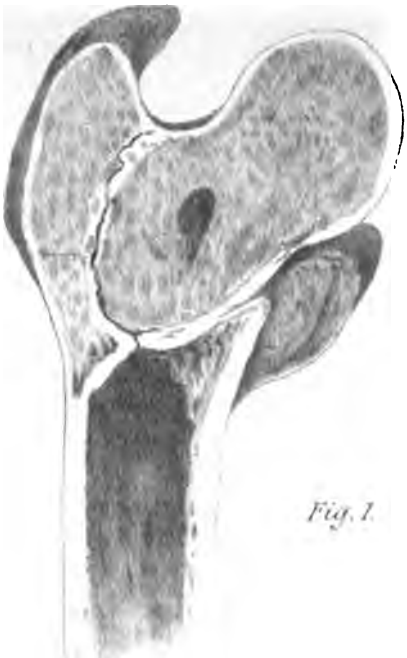


Fig. 1.

Fig. 2.

F. Huth Lith^r Edin^r

Dr. E. H. BENNETT ON EXTRA CAPSULAR FRACTURES OF THE NECK OF THE THIGH-BONE.

step at one of the doors in Merrion-square. She was whisked off the step and, alighting on her feet on the flag-way, she saved a fall by catching the area railings. She was unable to walk, and was carried to Sir P. Dun's Hospital, where I treated her. The evidence was clear that she had not fallen on her hip, but there was not a doubt on my mind that the fracture of her thigh bone was the extra-capsular of the neck. It united in the course of time, and the permanent enlargement of the trochanteric region, which characterises this form of fracture when united, confirmed the diagnosis made in the early days of the case. I cannot give pathological proof beyond this of the nature of the fracture, for the woman lived to walk out of the hospital. I cannot determine whether the fracture was of the ordinary type, similar to that I have quoted from Cooper, or whether it might more probably agree with the variety of which I now submit three specimens to the Academy.

In the typical extra-capsular fracture, the base of the neck of the thigh bone is driven into the cancellated tissue of the bone between the trochanters to a variable depth, and the compact tissue of its inferior wall is seen in a vertical section, buried in the cancelli of the bone, and crossing the line of the compact tissue of the shaft. The vertical section, as well as the appearance of the surface of the bone, shows that secondary fracture or fractures of the bone result from the impaction of the upper fragment into the lower. In specimens which present secondary fractures developed to the least degree, the great trochanter only is broken. Professor R. W. Smith, in the summary of his chapter on these injuries, writes:—"The extra-capsular fracture is accompanied by fracture with displacement of one or both trochanters," and in his discussion of this detail he writes: "Does it ever happen that the neck of the femur is broken external to the capsule without injury to the trochanter? My own

experience leads me to believe that it does not."[a] In this passage the term trochanter means great trochanter.[b] This character may, therefore, be looked on as a feature of the typical fracture as essential as the ordinary cause of the injury. The specimens I now submit break the law of the type, as in all the great trochanter has not been broken. Vertical sections expose the further fact, that in these specimens the mode of impaction is the reverse of the ordinary; the lower fragment is, to some degree, impacted into the upper. This exception in the mode of impaction has not escaped the notice of Professor R. W. Smith. He writes:—"There is a very remarkable variety of the impacted fracture external to the capsule, of which I have seen but one example. In this the lower fragment penetrates a short distance into the cancellated tissue of the superior, the reverse of what generally happens." An example of this singular form of impacted fracture has been delineated by Mr. King (Plate II.). Its occurrence must depend upon the direction in which the force which broke the bone was applied, but unfortunately I am not in possession of the history of the specimen represented in the preceding woodcuts.[c] I was able to identify these woodcuts as being taken from a half section contained in the museum of Steevens' Hospital, but there is no history preserved. I have seen such a specimen also in the museum of the Surgeons' Hall, Edinburgh, also without history. Mr. King's case[d] is without history bearing on the cause of the fracture. I have recently obtained from the dissecting-room a very perfect specimen of this variety of fracture (Plates III., IV., V.), and our museum contains two others. In these three the trochanter major has escaped fracture; in one the trochanter

[a] A Treatise on Fractures in the Vicinity of Joints. R. W. Smith. Page 111.
[b] Loc. cit., p. 16.
[c] Loc. cit., p. 35.
[d] Cyclopædia of Practical Surgery. Costello. Vol. II., p. 373.

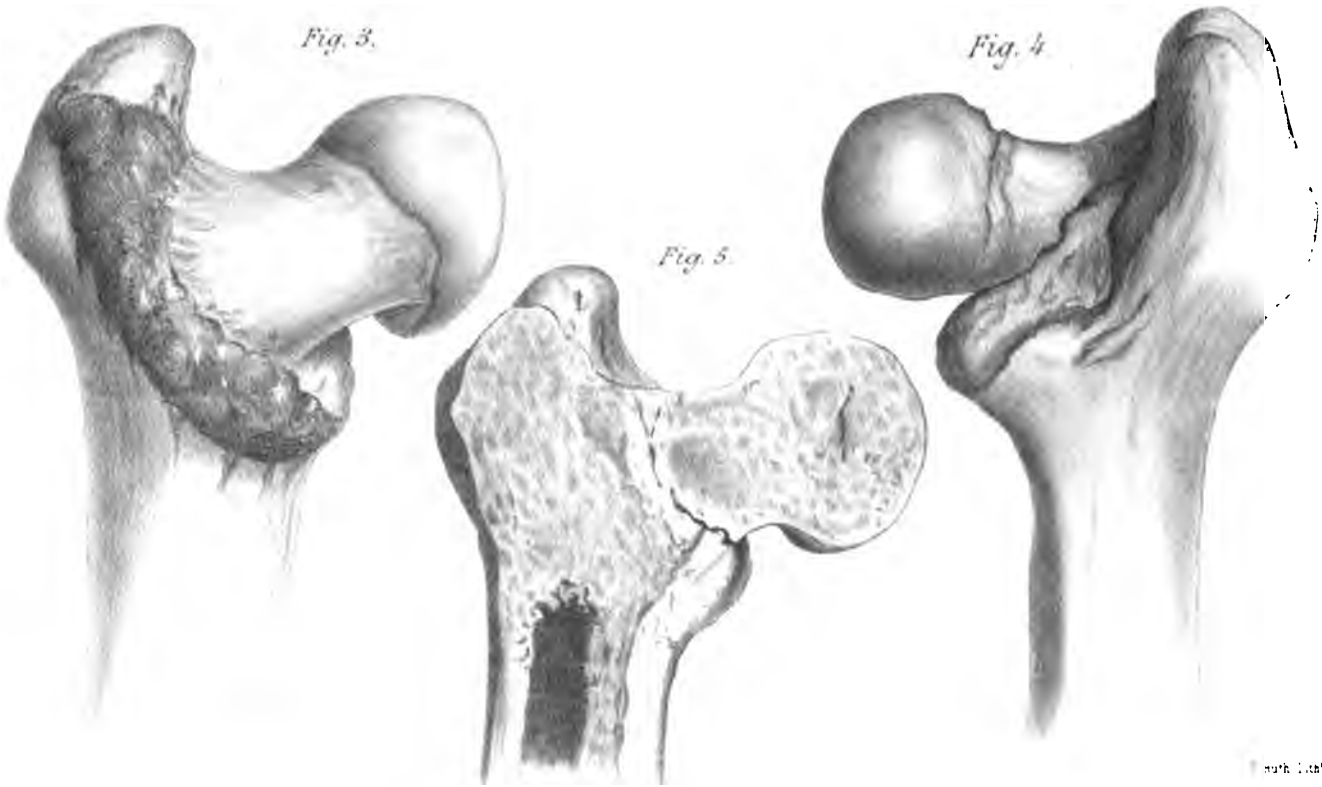


Fig. 3.
Fig. 4
Fig. 5.

minor was fractured. In looking at this last and most perfect specimen, one cannot help being reminded of the kind of injury which I have described in the case of the woman who was blown off by the wind and lit on her feet. If we could fill the gap by obtaining a clinical history, combined with a pathological examination of this fracture, we might set up in it a second but very rare type of fracture of the neck of the thigh bone. Even supposing this to be obtained, however, we cannot put aside Sir Astley Cooper's case, and we must admit that the fracture of the ordinary type may occur from a cause other than great and direct violence applied to the hip.

Dr. Myles asked Dr. Bennett what constituted an intra-capsular, and what an extra-capsular fracture. Having examined a large number of specimens, he thought these so-called extra-capsular fractures might be classified into those beside the head of the bone and those in the neighbourhood of the great trochanter. To call the latter fractures of the neck is a misnomer; they are rather fractures of the upper part of the shaft.

Dr. Bennett, in reply, stated that intra- and extra-capsular fractures of the neck were each of definite type, and were respectively inside and outside the capsular ligament. So constant are the specimens of each that the text-books are inclined to make one type for each. The interesting point in the three specimens shown was that the great trochanter was not fractured, and also the impaction was reversed.

A CASE OF TUBERCULAR PERITONITIS SIMULATING MALIGNANT TUMOUR.

By CONOLLY NORMAN, F.R.C.P.;
Medical Superintendent, Dublin District Asylum.

[Read in the Section of Pathology, February 17, 1893.]

EVERYONE is familiar with the commoner forms of tubercular peritonitis. Among the rarer is that condition in which there is no ascitic fluid found *post-mortem*, but the intestines are bound together by a pretty dense growth which supports them in such a way, that when one makes a section of the whole mass, the intestines appear like the holes in a Gruyére cheese, or, it were better to say, like what one sees in a frozen section of the body. A case of this kind I have seen in an autopsy at my asylum lately. Even rarer is the condition about to be described, though a less degree of the same state is not very uncommon.

J. G., the subject from whom this specimen was taken, was a patient in the Dublin Asylum for between nine and ten years. In the earlier period of his illness his mental symptoms consisted of delusions of persecution arising out of jealousy. Gradually the feelings of jealousy faded out, and the patient complained solely of persecution by unseen enemies, who tortured him in various ways, and put poison in his food. About a year and a half before his death he began to lose flesh and fail in general health. By this time he was full of suspicions of the medical staff, and would permit of no examination. He used to preserve pieces of bread from meal to meal, and point out to me where the poison which I was giving him "lay thick on them." He rapidly became haggard and sallow, and developed the "facies abdominalis," which one sometimes sees with abdominal cancer. He occasionally complained of terrible pains in his inside, which he attributed to the poison "rotting his bowels," but he obstinately resisted all attempts at examination. At no time had he a cough. Three or four

months before his death he became jaundiced. At this time he was much wasted generally, but showed distinct abdominal swelling. Up to the very last his resistance was so determined that a thoroughly satisfactory examination could not be made. However, on two occasions I was able so far to disarm his suspicions and calm his fears, that I could hurriedly examine the abdomen. A large tumour could be made out lying across the abdomen beneath the liver, from which it was separated by a distinct groove. Obscure tumours were perceptible, I thought, elsewhere, particularly in the left iliac region. The belly was a good deal swollen, and there was some fluctuation.

He sank gradually, and death appeared to be accelerated by a severe attack of diarrhœa. Heretofore he had suffered from a tendency to constipation, which was difficult to manage owing to his refusal to submit to any kind of treatment, but there had never been symptoms of obstruction.

Post-mortem.—The following appearances were found (omitting those not essential to our present purpose):—The apex of the left lung was tuberculous, and contained a vomica the size of a hazel-nut. The abdominal cavity contained about eighty ounces of somewhat turbid yellowish fluid, with a few large flakes of lymph. The peritoneum was everywhere enormously thickened. It presented everywhere a smooth surface. In some places the outline of the peritoneal folds was somewhat bossy, being raised in gently-swelling elevations; mostly, however, the thickness of any particular fold was pretty uniform. The liver was covered with a thick smooth whitish layer of altered peritoneum. The lesser omentum was shortened and enormously thickened, pressing up against the lower surface of the liver in the form of a dense roll. All the mesenteries were thickened out of all semblance of normal structure; some folds were more than an inch thick; the descending mesocolon nearly an inch and a half. In spite of the necessary stiffening of all the mesenteric structures, no obstructive kinking had been produced, and there were few adhesions. The most remarkable thickening existed in the great omentum. That body lay like a great scone or cake across the upper part of the abdomen. It was thinnest ($\frac{3}{4}$ inch) in its antero-posterior diameter at a point opposite the left extremity of the greater curvature of the stomach, and thickest at its right border where, when freshly removed from the body, it measured from before backwards, a little over three inches. In consistence it was

firm. The specimen as now presented has altered very little in appearance or measurements, having scarcely shrunk at all in spirit. It will be seen that the dense mass incised at either end is the great omentum, much contracted in its vertical direction, and enormously thickened. Along its upper border lies the stomach opened along its lesser curvature, along the lower border runs the transverse colon also opened, while across the front lies a loop of small intestine which had got caught up and had become adherent to the surface of the tumour.

The colour of the mass when fresh, like the rest of the peritoneal surface, was a dirty white. On section it presented the appearance of being trabecular, the trabeculæ of varying thickness from strong fibrous-looking bands to streaks just visible, being of a yellowish white colour, the contained substance of a semi-translucent greyish tint.

Microscopic examination shows here and there bits of almost normal mesenteric structure, connective tissue trabeculæ enclosing clusters of fat cells, &c. In some places the normal endothelium (epithelium) is distinct; elsewhere it is greatly proliferated in the form of large nucleated cells which lie along the trabeculæ or free in the interstices. In most parts the trabeculæ are surrounded by great accummulation of granulation cells, which, in some places, occupy the whole field. Among the masses of granulation cells are numerous giant cells. This structure is beautifully shown in the sections under the microscope, stained in alum carmine. Staining with carbol fuchsin shows tubercle bacilli.

The grey translucent appearance visible to the naked eye, is seen to be due to the presence of fat cells in the interspaces of trabeculæ too minute to be distinguishable with the unaided eye.

In this case I was inclined, as far as one could on the imperfect data at my disposal, to make an *ante-mortem* diagnosis of colloid cancer of the peritoneum. The difficulties of examining the patient prevented the discovery of the condition of his lungs, and the absence of pulmonary symptoms though common among the insane, put me off my guard with reference to the existence of consumption. Even if I had known of the existence of the latter affection, I doubt if I could have diagnosed tubercular peritonitis.

Eve, in an article in the Transactions of the Pathological Society (vol. 37, 1886), says, "clinically, the diagnosis between tubercular peritonitis and tumours of the omentum might present insuperable difficulties," and suggests an exploratory incision, pointing out that the smooth uniform surface of the tubercular growth will distinguish it. He describes the *post-mortem* appearances in a case occurring in his practice, in which he states the omentum was much enlarged, reaching in parts to the thickness of $\frac{3}{8}$ of an inch, firm on section with a smooth surface.

I have not been able to find an account of a tuberculous omental growth, approaching in size to the one I describe and exhibit.

Ulcer of the Stomach.—At the same meeting, February 17, Dr. Conolly Norman exhibited a fresh specimen of a healed ulcer of the stomach. The patient, an elderly woman, had not exhibited, while under his care, any digestive troubles. She died of consumption. On the anterior wall of the stomach, near the pylorus and close to the lesser curvature, was found a large puckered cicatrix the base of which was firmly adherent to the under surface of the left lobe of the liver. In fact, the thickened liver capsule appeared to form the bottom of the excavation which still retained elevated edges from which cicatrical tissue ran radially outwards. The specimen, Dr Norman said, was interesting as showing how death was probably prevented by the formation of an inflammatory adhesion between the liver and stomach before the ulcer in the latter had altogether destroyed the stomach wall—a fortunate and probably rare termination. There was no indication of general peritonitis, and no other adhesion among the abdominal viscera.

ADENOMA OF THE STOMACH.

By CONOLLY NORMAN, F.R.C.P.,
Medical Superintendent, Dublin District Asylum.

[Read in the Section of Pathology, February 17, 1893.]

The subject from whom this specimen was taken died two years ago in the Dublin District Asylum, at the age of twenty-nine years. He had spent all his life in workhouses and asylums, being an imbecile or high class idiot. Save for an occasional tendency to depression, not very common among patients of his type, there was nothing special about his mental symptoms. His general health seemed good till the oncome of his last illness, though he was of a frail build and meagre habit. A few months before his death he began to lose flesh very rapidly, and became very feeble. The temperature was generally subnormal—never raised. There was no vomiting—no complaint of pain. Occasional sharp attacks of diarrhœa, lasting two or three days. Towards the close there was absolute anorexia, but this was hardly to be wondered at considering his general condition of debility. He died apparently of mere exhaustion.

On autopsy there was found in the apex of each lung a small caseous nodule with a firm capsule, surrounded by some cicatricial hardening—no appearance of recent trouble. The heart and aorta were normal. The abdominal viscera presented no abnormality save that to be described in the stomach. The abdominal glands were normal. There was no trace of epitheliomatous growth in the intestines, nor of secondary cancerous deposit anywhere.

The stomach was dilated and rather baggy, the wall generally being somewhat thin. The mucous membrane was of a uniform pale gray colour. There were no hæmorrhagic discolorations and no special injection. The surface presented a multitude of irregularly arranged tumours, varying in size from the head of a large pin to a large pea. They were rather more frequent along the greater curvature and on the posterior aspect. The cardiac extremity of the great curvature contained few of these growths. On the other hand, they were very numerous towards the pylorus on

all aspects of the organ. Here they were generally small and perfectly sessile, and the condition presented was exactly that which the French authors have described under the name of the "état mamelonné" (mamelon=mammilla). Among these elevations and elsewhere arose distinctly pedunculated growths, some of which were arborescent in form. Two large growths existed on the posterior aspect of the stomach, one about the middle of this surface, one near the pylorus, of a perfectly dendriform shape, with an elongated peduncle (stem) and decompound branches. From the base of the stem to the extremity of the twigs these growths measured almost 1½ inch. One of these is still to be seen in the preparation on the table. The other has been removed for microscopic examination, and sections from it are beneath the microscopes.

Microscopically the following are the appearances found:—In the neighbourhood of the new growths the stomach glands are degenerated, presenting a little differentiated or undifferentiated cylindrical epithelium instead of the normal secreting cells. The tumours consist of a congeries of tubes and saccules lined with cylindrical epithelium cells, containing a clear or slightly granular protoplasm, and towards the base a deeply staining nucleus. A basement membrane is distinct. The tubes turn and twist in various ways, showing infinite variety according to the manner of section. In some places the appearance is presented of a distinct cyst, with papillary or dendriform growths filling it up. Here and there, more particularly in the cystic enlargements, the cylindrical cells have assumed the calyciform or beaker shape. The epithelium lined cavities and tubes are separated from each other by a variable amount of connective tissue, which, towards the centre of the growths and where it occurs elsewhere in quantity, assumes a fibrous character. Delicate bands of connective tissue run into the centre of the various papillary and dendriform out-growths. Here and there through the connective tissue are deposits of small celled infiltration. With exceptions to be noted below, the epithelial elements do not extend beneath the muscularis mucosæ, which remains intact. The submucous tissue is raised into an elevation corresponding to the degree of prominence of the sessile tumours or runs far up into the stem of the dendroid tumours, carrying vessels.

In these arborescent tumours the peduncle (stem, measuring little under ¼ inch in diameter in the largest) was free from internal epithelial growths, and the first and larger divisions showed the

submucous free from invasion, but among the finer subdivisions the muscularis mucosæ was often interrupted, the *culs de sac* of the tubules extending beneath that layer. I cannot make out any independent tubules or cysts occurring beneath the muscularis, and not obviously belonging to the superficial series.

Tumours of the stomach, resembling those above described, have been long known under the names of gastric polypi, gastric polyposis, gastritis polyposus, &c.

Brissaud, in an excellent memoir, published about eight years ago, tells us that the history of these growths dates from the writings of Cruveilhier (1833), and he quotes a number of observations made, chiefly by French authors, since that time. This author himself divides gastric polypi into fibrous and mucous, and he proposes for the latter the name of gastric polyadenoma, stating that this affection had not hitherto been described under the name of adenoma.

Characteristic of polyadenomatous tumours, according to B., are:—(1) Their structure similar to that described; (2) The fact that they involve only the mucous membrane, and are freely movable on the cellular tissue beneath; (3) "The identity of volume of all the polypi in each individual case." He quotes, from Camus-Govignon, a case of Rouillier's in which there were 80 polypi, *each* the size of a hazel-nut.

He sees no reason for believing that this condition is the result of chronic gastritis. Gastritis had not existed in the case of which he made a special study. It had preceded a case of Vulpian's, but neither gastritis nor the existing lesion had been suspected in the cases of Cruveilhier, Richard, and Lionville. One case is recorded associated with tuberculosis, and one with alcoholism.

He dwells upon the advanced age of the patients, pointing out that there is a tendency to adenomatous affections in the old.

Ménétrier has devoted a couple of exhaustive papers, in

the Archives de Physiologie (1888), to "gastric polyadenomata and their relations to cancer of the stomach." He describes two varieties, the polypous polyadenomata and the flat polyadenomata (*polyadénomes en nappe*). The latter are described as being large hypertrophic plaques, projecting above the rest of the mucous membrane, occupying almost the entire extent of the stomach, rising in great folds, and recalling pretty much the appearance of the cerebral convolutions. We need not further consider this variety except to note that M. believes in its essential identity with the polypous variety, and holds that either, though originally benign, may become malignant and infecting. He divides the polypous polyadenomata into two further types—(1) in which the hypertrophy attacks especially the excretory portion of the glands; and, (2) in which the process more particularly effects the glandular *cul de sac*; but he admits an intermediate type in which both parts are equally involved. It seems to me that my case belonged to the mixed type.

Ménétrier dwells, like Brissaud, on the similarity in size and age (state of development) of the tumours in any individual case. No clinical history pointed to the special lesions in any of the cases he found recorded. The sufferers have almost all been old people, and almost all M.'s own cases have presented atheromatous degeneration of the arteries. Unlike Brissaud, he has found gastritis a common antecedent, and he thinks "that chronic irritation plays a part in the production of gastric adenomata, though it is not their sole cause, nor will it explain all the cases." He conjectures that there may be a more general influence at work, and he refers to the fact that in many cases there were found productions of similar nature of other organs (adenomata of uterus, intestinal epithelioma), and to the coincidence of arterial atheroma.

My case presents the following peculiarities :—

1. The patient was comparatively young.

2. The tumours were of very various sizes and shapes, and suggested anything but that they were all of the same age and degree of development.

3. There were no hæmorrhages into the stomach, and no indications of atheroma.

4. In what appeared to be the older and more developed growths the epithelial structure had broken through the muscularis mucosæ. Nevertheless, and in spite of the difference noted under (2), I cannot but think that these growths are identical with those described by Brissaud and Ménétrier. On the other hand, there were no depots of epithelial tubules occurring deeply through the submucous coat, as described by Ménétrier in cases which had become epitheliomatous. It is probable that in my case a transition period is represented.

5. The patient appears to have died of this condition—an unusual circumstance.

That there were no particular symptoms seems to have been merely in accordance with what generally occurs. We may take it that there was no pain (as the patient was quite capable of complaining, and was constantly interrogated), and this also appears to be the rule.

The cause in this individual case I do not pretend to conjecture. Up to the illness which terminated his life the patient was not known to have suffered from any symptoms that might point to gastric trouble. He was certainly not an alcoholist. He had, as above noted, suffered at some time from tuberculous lung mischief, but this had become quiescent, and probably in no way interfered with his general health for some years.

Mr. F. A. Nixon remarked that it was remarkable there should be such extensive organic disease of the stomach without any

symptoms. Very frequently, in patients of weak intellect, subjective or objective symptoms are very badly marked. He remembered a case of melancholia in which the patient had a most extensive pleural effusion, and yet he made no complaint, nor had he any dyspnœa.

Dr. Norman, in replying, also remarked on this fact, and said he had met quite a number of patients of this class who died of phthisis and yet had no cough.

DUR-HÆMATOMA ASSOCIATED WITH JACKSONIAN EPILEPSY.

By JOHN EUSTACE, JUN., M.B., B.Ch. (UNIV. DUB.), M.P.C.;
Assistant Medical Superintendent Hampstead and Highfield Private Asylums;
Late Clinical Assistant, Royal Asylum, Morningside, Edinburgh;

AND

ALFRED R. PARSONS, M.B., B.Ch. (UNIV. DUB.), M.R.C.P.;
Assistant Physician to Sir Patrick Dun's Hospital.

[Read in the Section of Pathology, March 24, 1893.]

Clinical History.—Mr. X. was admitted to Hampstead in September, 1888. He was twenty-eight years of age, unmarried, and a farmer by occupation. With the exception of an uncle, who died of syphilitic general paralysis of the insane, there is no family history of insanity in either direct or collateral branches. Father and mother are both living; the former suffers from paralysis agitans. One sister has occasional attacks of hysteria.

It is certain that the patient was not addicted to alcohol or sexual excess, nor had he contracted syphilis. There was a vague history of a blow on the head when a child, but at the time it was not considered necessary to call in a doctor, and neither during life nor after death could we discover a scar.

For about a year prior to admission Mr. X. appears to have suffered from *petit mal*, and was treated with bromide by the family physician. His friends did not consider him insane until the week before admission, when he commenced to plan and build a house on a magnificent scale. Sandringham was taken as a model, and artificial lakes, acres of gardens, huge glass-houses, and expensive plantations figured in the design. He was engaged to be married, and when remonstrated with explained that he thought nothing too good for his wife.

The immediate cause of his being sent to Hampstead was that he made an attempt to stab his sister with a pruning knife. Drs Dobbs and Evans signed the certificates, and I am indebted to them for the previous history of the case.

On admission his condition was diagnosed as simple mania. He was intensely happy, very garrulous, pleased with his surroundings, and did not appear to find the restraint of asylum-life irksome. He was vain of his personal appearance, and boastful to absurdity of his strength and of his hunting exploits. However, he was sufficiently sane to be permitted to roam about the grounds and farm by himself, and to ride and drive accompanied by an attendant. The physical examination proved that he was in excellent bodily health, and that all his viscera were normal.

During October he had three attacks of *petit mal*, and the riding was discontinued.

In November he had his first true convulsive seizure. It occurred when he was playing billiards, and he had no premonitory symptoms, but, turning pale, suddenly fell on the floor, and had a general convulsion. It was observed by the attendants that the *left* arm and leg worked more violently then the right. He was at once put to bed, and when seen was in the comatose stage. Temperature, 101°; pulse, 98, very full and bounding. The *left* side, and particularly the arm and leg, were bloodless, cold, and paralysed.

Dr. Arthur Wynne Foot saw him several times in consultation with my father, and the probability of the existence of a tumour affecting the right hemisphere of the brain was discussed, but the signs were not deemed sufficient to warrant operative interference. Dr. Swanzy examined his eyes, but could detect nothing abnormal.

Similar attacks to the one I have described occurred during the next two years, on an average once a fortnight, but sometimes two or three fits would occur in the same week. Brown-Séquard's bromide mixture, though pushed till acne appeared, did not give relief, but the patient himself had great faith in antipyrin tabloids (gr. v.), and as the case progressed and subjective premonitory symptoms set in, such as headache, a feeling of anxiety, formication in the left hand, &c., in addition to obvious flushing and tremor, he believed that he frequently warded off an attack by swallowing a tabloid, or by tying a string round his left wrist. He also believed that sitting near a fire or in a very warm room induced an attack, and as a matter of fact under those circumstances he frequently had a fit. Several points are noteworthy in connection with the seizure:—

(1.) The premonitory stage lasted five or ten minutes, and sometimes was not followed by an attack. (2.) The left thumb commenced as a rule to twitch first. (3.) The convulsive stage varied

greatly in severity and duration, lasting from two to fifteen, or even thirty minutes. (4.) The pulse during this stage was hard and small, but as soon as he passed into the comatose stage it became very full, rapid, and bounding, increasing from 60 or 70 to 100 or 110, and the frontal arteries stood out like thick cords. (5.) There was conjugate deviation of the eyes to the left. (6.) The post-paroxysmal stage generally lasted from one-half to two hours, or even longer.

In September, 1890, as he was facile, weak-minded, had no delusions, and had not had a fit for nearly a month, he was sent home on trial, but the excitement consequent on the change appears to have greatly accelerated the process of degeneration, for in a week he was reported by his friends as having passed from being "very strange" to be so dangerously violent as to necessitate his return to the Asylum. A few days later Dr. Wilson (Assistant Physician) noted—"Very stupid, cannot articulate clearly, although he tries to talk incessantly. Is restless, and so unsteady in his gait that he cannot walk without support." He was given a tonic and fattening diet, and improved during the next month, but on November 13th, 1890 (*i.e.*, about two years after admission), he had a slight general convulsive seizure. This attack stands out as a landmark in the history of the case, for after it the *right* side, and not the left as formerly, was paralysed for about half an hour. The next day at 11 a.m. he had premonitory symptoms of an attack and stayed in the house, but it did not develop until 4 p.m., when he became aphasic, and without any obvious seizure the *right* side again became partially paralysed. At 1 a.m. he vomited a quantity of mucus and appeared to be sinking; his pulse rose to 128; temperature, 100°; respirations, 48. His lips and teeth were dry and covered with sordes, his eyes glazed and half open. He remained in this state till late the next evening, when he had a slight seizure. From this condition he gradually rallied, but during the next six months became more and more demented, although he had no attack till May, 1891, when he had seven fits within an hour, and both sides appeared to be equally affected. During the following month he developed symptoms of acute mania, and about the end of June control of the bladder and rectum was lost.

In August the case came directly under my care, and taking into consideration the slurring speech, the paresis, the epileptiform seizures, a lingual tremor (which, however, was not constant), and his state of joyous mania, in addition to spastic myosis,

exaggerated reflexes, incontinence of urine and fæces, and recollecting his previous history, I pronounced him an anomalous case of general paralysis of the insane of the epileptiform, non-delusional variety—a diagnosis that was not verified by the *post-mortem* appearances.

He now increased in weight from 10 stone to 11 stone 2 pounds in four months, but from this date degenerated very fast. The convulsions, which were few, were localised to the right side, and lasted from a few minutes to one or two hours. Trismus now became a troublesome symptom in the first paroxysmal stage, lasting from twelve to twenty-four hours, and necessitating feeding by the nasal tube. A large dose of chloral and bromide, however, almost invariably curtailed the attack. It was given with his food, and at the same time a hypodermic injection of sulphate of atropin was administered. He now became so completely paralysed that from May till July 30th, 1892, when he died, he was confined to bed. He rapidly developed bed-sores, and finally pneumonia terminated his life.

During the last three months he had twice passed into the *status epilepticus*, and in order to carry out the chloral treatment it was necessary to chloroform him. Though in this state the convulsion was general, the right side was up to the last distinctly more affected than the left.

The *post-mortem* examination was made on the 1st of August, 1892. The skull-cap presented no abnormal appearance, and was removed without any unusual difficulty from the underlying dura mater. The external surface of the latter was likewise normal, but on reflecting it on the left side an extensive membrane (Fig. 2), covering over the whole of the hemisphere with the exception of its basal surface, was disclosed. This membrane was slightly adherent to the inner aspect of the dura mater, but had no organic attachment whatever to the arachnoid. It was of a bright red colour, and was practically of uniform thickness—about three-sixteenths of an inch—throughout its entire extent. On similarly reflecting the dura mater covering the right cerebral hemisphere, a structure became apparent which in some points resembled that found on the opposite side, though it differed considerably in its thickness and intimacy of attachment to the dura mater. Over the anterior part of the frontal and the occipital lobe the membrane was very thin, being little more than a delicate vascular veil, which could be readily peeled off the dura mater;

while over the posterior portion of the frontal and the parietal lobe, it formed a large semi-fluctuating tumour (Fig. 1), measuring about an inch in its maximum thickness, and more firmly adherent to the dura mater. The brain tissue lying directly underneath this new formation was flattened and softened from its pressure. The pia-arachnoid was not morbidly adherent to the cortex, it was not waterlogged, and there were no granulations in the ependyma of the ventricles. Except the softening and flattening above mentioned, the brain presented no lesions visible to the naked eye. The weight of the brain meninges and tumour was forty-nine ounces, while the tumour, with the dura mater of its own side, weighed seven ounces. About five ounces of sanguineous fluid were drawn off from the sub-dural space.

A small portion of the membrane on the left side showed under the microscope numerous fibres intertwining with one another, blood-corpuscles in different stages of degeneration, and masses of pigment. When a section was made into the tumour its external wall was found to be firm, about one quarter of an inch in thickness, and composed of several laminæ of strong fibrous tissue, from the most external of which the dura mater could be detached without using much force. The inner wall of the tumour, on the contrary, was exceedingly thin, and when partially reflected showed a cyst filled with a large quantity of coagulated blood. As the clot had not undergone so-called organisation, and as no crystals of hæmatoidin could be detected in it, the probability is considerable that the hæmorrhage took place shortly before the patient's death. The dense fibrous tissue constituting the external wall of the cyst was probably of some years' standing.

Several terms have been applied by different authors to the pathological conditions present in this case. Of these it may suffice to enumerate the following:—Pachymeningitis hæmorrhagica interna, hæmatoma of the dura mater, arachnoid cysts. Such formations, though stated to occur in profound alterations of the blood, in the acute infectious diseases—particularly in typhoid fever, scarlatina, small-pox, and relapsing fever—or as the result of injury, are exceedingly rare outside lunatic asylums. Gowers[*] states that for

[*] Gowers. Diseases of the Nervous System. Vol. II. P. 294.

forty years not a single specimen of this condition was exhibited before the London Pathological Society, which receives the curiosities of metropolitan necroscopy. In asylums these lesions are by no means so uncommon. Of 637 unselected *post-mortem* examinations on the insane at Rainhill Asylum, Wigglesworth[a] states that 54 presented varying degrees of this affection. The age of the youngest patient was thirty, and the average age of the series of 54 cases was 51·61 years. The maximum number of cases in any one decade was 18, and these occurred in the decade from fifty to sixty.

Of the different forms of mental disorders associated with pathological features similar to those under consideration at present, general paralysis stands out prominently. Over half (29) of Wigglesworth's series were general paralytics. A similar proportion has been obtained by Bevan Lewis[b] from statistics based on 132 cases. He found that of these 63, or 47·7 per cent., suffered from general paralysis. In addition to the factors above enumerated in the production of this morbid condition, chronic alcoholism is mentioned by several authors.

The process is in almost half the cases bilateral, but often more marked on one side than the other. The membranes lie most frequently on the vertical and lateral aspects of the hemispheres, but may extend on to the base. They are, however, rarely, if ever, found on the lower aspect of the tentorium, or in the cerebellar fossa.

The pathology of the condition, notwithstanding the attention which has been devoted to it during the past fifty years, is not yet fully solved. Two main theories of the causation of these membranes have been propounded. These may be described briefly as the inflammatory and the

[a] Dictionary of Psychological Medicine. P. 879.

[b] Text-Book of Mental Diseases. P. 440.

hæmorrhagic respectively. Prescott Hewitt, in a paper read in 1845 before the Medico-Chirurgical Society, advocated the latter theory; but in 1854 Virchow published his views in favour of their inflammatory origin, and they were for many years those generally accepted by pathologists. Latterly Huguenin, in an exhaustive article in von Ziemssen's Encyclopædia, revives and strengthens Prescott Hewitt's theory, and pathological teaching in the English school seems to tend in the same direction.

According to the inflammatory theory, the thin gelatinous film, which is the earliest stage in the formation of the membrane, is the result of an inflammatory exudation. This becomes organised, and other membranes are formed on top of it, thus producing its laminated appearance. The hæmorrhages, which often occur between the new-formed membranes, are attributed to the rupture of the recently-formed vessels. The advocates of the hæmorrhagic theory, on the contrary, teach that the primary mischief is a hæmorrhage, and explain the laminated character of the membranes by assuming a succession of hæmorrhages. Most authorities are of opinion that the blood is derived from the vessels of the pia mater, which, owing to the loss of support produced by the atrophy of the convolutions, are particularly liable to bleed. A recent writer,[a] however, contends that the blood is derived from the vessels of the dura rather than the pia arachnoid, and that the cause of the hæmorrhage is not a mere "loss of support," but the gradually diminishing intracranial pressure exerting a suction action on the vessels similar to that produced by the process of dry-cupping.

In the case under consideration the ease with which the tumour can be detached from the dura mater, and the absence of any marked thickening of the latter, would seem

[a] Article in the Journal of Mental Science for April, 1893. By Dr. Robertson.

Fig. 2.

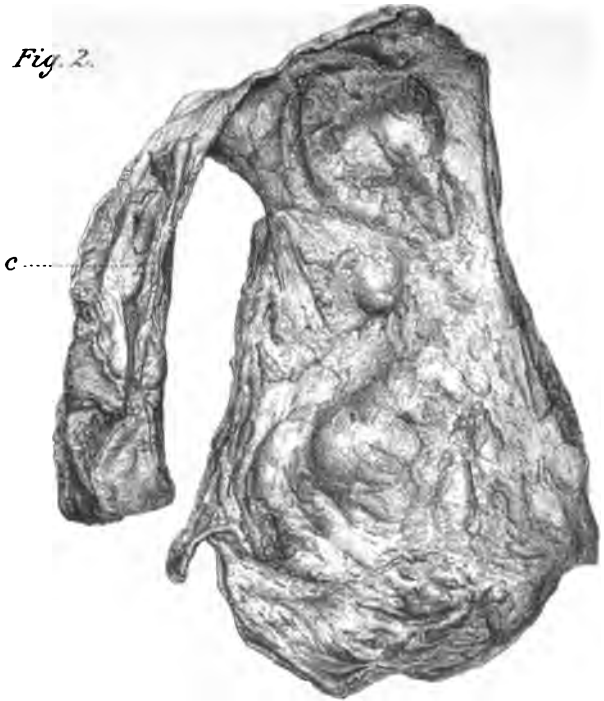
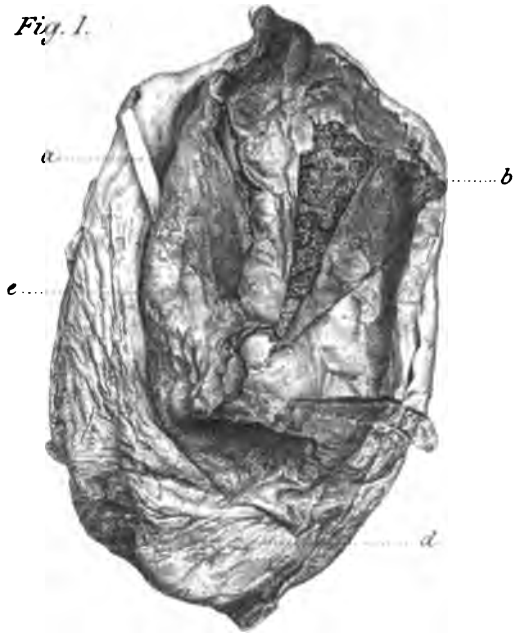


Fig. 1.



DUR-HÆMATOMA ASSOCIATED WITH JACKSONIAN EPILEPSY.

Drs Eustace and Parsons.

F Huth Lith^y Edin^r

to point to a hæmorrhagic rather than an inflammatory origin.

The symptoms connected with hæmatoma of the dura mater vary considerably. In some cases they are in complete abeyance, while in others they suggest cerebral compression. In the light of the *post-mortem* examination it seems probable that the convulsive attacks in 1888, which chiefly involved the left side, were produced by a series of hæmorrhages over the right cerebral cortex. In process of time these became organised, and shortly before the patient's death a profuse hæmorrhage took place between the laminæ, and so produced the hæmatoma shown in Fig. 1. The extensive membrane covering the left cerebral hemisphere was probably formed about 1890, and manifested itself by convulsions involving chiefly the right side.

Bearing in mind the frequent association of dur-hæmatoma with general paralysis of the insane, the absence of the usual pathological signs of the latter at the *post-mortem* examination is interesting.

EXPLANATION OF THE PLATE.

Fig. 1.—Dur-hæmatoma with dura mater of right side attached—
a. Probe passed between tumour and dura mater.
b. Inner wall of tumour partly reflected, showing coagulated contents.
d. Inner aspect of dura mater covered by thin, false membrane.
e. Membrane detached from dura, and reflected on to tumour.

Fig. 2.—Pachymeningitis hæmorrhagica interna of left side—
c. Falx cerebri.

Dr. Bennett thought it was very important that the prevalent opinion that these tumours were of frequent occurrence after traumatism should be contradicted. The erroneous statements present in text-books originated in Prescott Hewett's account of the disease in "Holmes' Surgery."

SECTION OF STATE MEDICINE.

THE INFLUENCE OF PUBLIC CLEANSING ON THE MORTALITY OF TOWNS.

By D. EDGAR FLINN, D.P.H., F.R.C.S., M.R.C.P.;

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[Read in the Section of State Medicine, February 10, 1893.]

A DISTINGUISHED sanitarian describes the process of public cleansing as "the immediate removal of all matter liable to pollute earth, air, or water." The word immediate has a pronounced significance here, for in the immediate removal of towns' refuse and filth lies the essence of the benefits to be derived from public cleansing. No system of town cleansing, be it either public or domestic can be maintained or efficiently carried out, unless it be undertaken solely by the Sanitary Authority, for according as our towns grow and dwellings increase in number, so much more difficult does it become for individual householders to dispose of their refuse. Again, it is a self-evident fact that the habits of the occupiers of tenement dwelling-houses are a source of difficulty in the cleansing of all towns, be they large or small, and it is unreasonable to expect people to be cleanly in their habits unless certain facilities are offered them, and their houses and surroundings kept in a tolerable state of cleanliness by the corporate body. Of course in this question of public cleansing the situation of a town, its water

supply, the method of sewerage, the habits of its population, are each and all of them more or less determining factors in the successful carrying out or otherwise of a particular plan.

It is an established fact that all our great epidemics have their origin in the laneways, court-yards, and alleys of our towns, and these are especially the localities where public cleansing and scavenging should be systematically and daily carried out. These places are generally the homes of our errand-boys, dairymen, van-drivers, porters, and such like, and the dwellings and surroundings of this class of the population should be maintained in as healthful a condition as possible. When localities of the kind I have mentioned preserve a low rate of mortality, it follows that the dwellers in the better quarters of a town have a corresponding immunity from sickness and diseases, more particularly of an infectious character.

Unless it be in purely agricultural districts, it may be laid down as a rule that no appearance of truly local cleanliness can be maintained unless public scavenging, removal of house refuse, as well as the sewerage, is organised and carried out under the management and direction of the sanitary authorities. This in recent years has come to be an acknowledged fact, and the daily removing of house refuse is now in a large majority of towns in Great Britain recognised as one of the most important duties of the health department. To this system of public cleansing the reduction both of the general and zymotic death-rate is in part attributed. Previously to the inauguration of the system of public cleansing and domestic scavenging now carried out by the Dublin Corporation, the cleansing of ash-pits, &c., was undertaken by persons who contracted with householders for the removal of such refuse matter. This refuse was stored in laneways and yards, until it was sorted of its bones, rags,

cinders, &c. These manure depots were scattered all over the city, and large areas of polluted soil was the result. This system had been going on for years, and no doubt it contributed to the propagation of infectious disorders, and helped materially to increase the death-rate. Nor was this system peculiar to Dublin—other large towns in Ireland, such as Belfast, Cork, Limerick, Waterford, tolerated this vile and objectionable method of filth collection; a method, too, which gave to the Irish towns a reputation for uncleanliness which was becoming proverbial. It is a matter of notoriety that since the entire scavenging and cleansing of the City of Dublin, both public and domestic, was undertaken by the Corporation, the rate of mortality from diseases of a zymotic nature has visibly decreased. Nottingham, Oldham, Plymouth, Newcastle, have similar experience.

Sir Charles Cameron, our distinguished Medical Officer of Health, in his last-issued Annual Report on the state of the public health in the city of Dublin, recognises the great advantage of public cleansing and filth removal. He says:—"There are few points in the sanitation of towns of so much importance as that of filth removal. It is of especial importance in Dublin. A large portion of the city is situated upon low-lying situations, and upon gravel and other sorts of slight coherence. In such soils filth largely accumulates, and gives off offensive emanations into the overground atmosphere. The great sources of the filth of soils are the privies and ashpits; their contents leak into the ground and stagnate therein. Every year we succeed in getting privies abolished and water-closets substituted therefor; and it is to be hoped that in a few years Dublin will be as free from privies as Edinburgh now is. I know of no sanitary work more important than this daily cleansing of the yards and sanitary accommodation of the tenement houses."

The Medical Officer of Health for Kingstown, Dr. Byrne Power, also attributes the decrease in the zymotic death-rate of that town to the inauguration of a system of public and domestic cleansing wholly undertaken by the Sanitary Authority, the average zymotic death-rate for three years being only 1·1. In a recent Report he states that "the zymotic death-rate has been on the decline—a fact that I can only account for by the introduction of an ably-organised system of filth removal."

The Belfast Corporation has recently undertaken the systematic removal of refuse from the dwellings of the inhabitants, and, according to the Report of the Medical Officer of Health for Belfast (Dr. Whitaker), the system has been attended with the best possible results, and is already having an influence on the health of the city. I have been favoured with a copy of the Report for the year 1892, of the Executive Sanitary Officer of Belfast, Mr. Conway Scott, C.E. A system of public cleansing was inaugurated in Belfast only in the commencement of last year. In his Report, the Executive Sanitary Officer mentions that so great was the amount of refuse that it took nearly four months to give the city its first regular cleansing, the cost being £2,169. Mr. Scott says that the sanitary effect of the regular removal of such a mass of refuse matter must be beneficial to the public health, and he asks the pertinent question—"What became of the mass of refuse matter in former years? One thing is certain, the great portion of it never left the city." The same question might be asked as regards Dublin—"Where did the vast volumes of rubbish and filth, collected in former years, before the Corporation undertook public cleansing, find a *locale?*" Three-fourths of it never left the precincts of the city. The idea forcibly suggests itself that some of the foundations of our newly-made streets in the northern and southern districts of the city may be in great part

composed of this combination of rubbish, &c.—surely an insanitary foundation, and one that may tell its tale in the years to come. The zymotic death-rate for Belfast averaged for the ten years ending 1891 3·5; in Dublin during the corresponding period the zymotic death-rate was 3·3.

In Cork, also, a system of public and domestic cleansing has for some time been put in operation, and the daily collection of house refuse is now undertaken by the Corporation; it has not yet been sufficiently long in working to speak of its merits, or the benefits accruing from its inception, but the death-rate from zymotic diseases is below the average in Cork, the rate being returned as 1·3 per 1,000 per annum.

Londonderry and Limerick both show a low zymotic death-rate for the year 1891, the former being 1·2 and the latter 0·9 per 1,000—in both cities improved methods of public cleansing have been in operation for some time.

The Royal Commission that sat at Dublin in 1879, under the presidency of Sir Robert Rawlinson, C.B., and Dr. Francis Xavier MacCabe (now Sir Francis MacCabe, the eminent Medical Commissioner to the Local Government Board), commented in anything but complimentary terms on the then existing public cleansing and scavenging arrangements in the city, and one of their recommendations was that the entire cleansing and scavenging of Dublin, both public and domestic, should be undertaken and carried out by the Corporation; this recommendation bore good results, and the aspect of our capital has visibly improved since the civic authorities undertook this responsibility.

The general death-rate has not diminished to any appreciable extent, but the zymotic death-rate bears very favourable comparison with that of other large cities; of course, it is evident that public cleansing is only one of the many reforms of a sanitary nature that go to assist in making

towns healthful; the system of drainage is also an important factor, and, no doubt, when the main drainage system is an accomplished fact in the city of Dublin, it will assist materially in diminishing the death-rate, both zymotic and general.

A word now as to the necessity of active measures in public cleansing. The immediate removal of all refuse and filth is the most essential element in the public cleansing of towns. Even to deposit refuse temporarily on the ground is dangerous, as the atmosphere of the dwellinghouse is very much affected by the state of the atmosphere of the soil near it. If the soil near a dwelling is allowed to become impregnated with refuse and filth, which is so often cast out of houses of the tenement order, the air must naturally become polluted, and will carry the germs of many diseases to houses at a distance; public cleansing, then, cannot be too strictly enforced, and its thorough administration becomes year after year more apparent and more necessary for the health of the people and the prevention of disease.

The daily door-to-door collection at a stated early hour each morning, by means of portable dust-bins, supplied by the authorities, and large enough to contain the refuse collected during the twenty-four hours, is a system working well in a large number of towns. It is certainly a vast improvement on the system of emptying all house refuse into an open ashpit in close proximity to the dwelling-house, where a fermenting mixture of dust and vegetable and animal matter is permitted to remain for a long period, creating a public nuisance and a danger to the health of a neighbourhood.

The portable pail collection of house refuse should be enforced by every sanitary authority, for it appears to be the best and readiest system, each householder above a certain rating being supplied with a pail at a small charge, and the

poorer class of houses being supplied with them free of cost. In small courtways one large pail could be placed in a convenient position, and would suffice for three or four cottages, or fixed ash-bins in tenement yard, capable of holding the dry refuse of eight or ten houses, and cleaned out daily, is a good and useful alternative; in fact, this would be preferable to having a number of bins, and would render it easier to keep a courtyard or laneway in a cleanly condition. These should be emptied each morning by the Corporation at a certain hour.

Vegetable refuse is a difficulty, and all sanitary authorities have more or less to contend with, as vegetables form an important part in the diet of a great majority of the people, the trimmings and parings of vegetables, fish, fruit, and the like, constituting a most unwholesome form of nuisance, and requiring to be promptly dealt with. Regarding this class of refuse, it is of the utmost importance that authorities should insist upon its immediate removal, as it is a prolific source of disseminating foul and offensive odours, more especially when allowed to remain for any length of time exposed to the atmosphere, and is a menacing danger to the public health.

The pail system of daily refuse removal from the houses of the poorer classes is of decided advantage, more especially if the water system of removal of excreta is not available. This system answers admirably in some large towns in England and Scotland—notably Leeds, Nottingham, Rochdale, Glasgow, Edinburgh. It is a matter for regret that the pail system has not found more favour in Ireland. It has apparent advantages, and might be applied to a number of small towns in Ireland with great benefit, and its adoption would be speedily followed by a decrease in the number of those diseases which go to augment the death-rate in most of our Irish towns and villages.

To aid in the fulfilment of the benefits to be derived from public cleansing, the domestic cleansing of the houses of the poorer classes is a necessary adjunct, and they must be taught that the initial principles of sanitary work commence in the individual house. The destruction of the first germ of disease is of the utmost importance, and it is to the houses of those resident in the courts and laneways of our cities and towns that the lesson should be taught, that national health lies in the individual cleanliness and surroundings of the house and its inmates. Take the home of a steady, industrious artisan, and note the air of cleanliness existing there; note the cleanly wife and mother, and inquire have they had much illness in their midst, whether they have lost any of their children by any of the infectious disorders (whose abode is always to be found in the midst of filth and overcrowding), and you will most likely be answered in the negative; but pay a visit to the next door neighbour, whose children betoken the little care that is bestowed on them, and you will find all the elements of domestic cleanliness absent, and King Filth reigns supreme. Truly may it be said that "the web of our life is of a mingled yarn, good and ill together;" and our homes are liable at any moment to be invaded with a malady contracted or borne perhaps from the bylanes or courtways close by. Hence it is vitally important that our poor neighbours should have every advantage offered them to keep their homes and surroundings in a sanitary state.

Dr. Falkiner said that he rarely saw a nuisance existing in a lane or alley. In this respect the scavengers do their work admirably. How to deal with the houses, which are beyond the reach of the scavengers, is a very difficult problem. Certainly five-sixths of the tenement houses in his district are unsuitable for human habitation.

Dr. Denham said that the principal point now to be considered with regard to the removal of the filth of Dublin was its ultimate disposal. He believed that destructors in a central place was a better system than that at present adopted, which entailed the lodgment of the matter on the boat beside the quay wall for several hours.

Dr. J. W. Moore said he thought that Dr. Flinn laid undue stress on the removal of refuse as a means of abating the zymotic death-rate, since diseases such as enteric fever, scarlatina, or erysipelas had not decreased. Typhus fever and some of the eruptive fevers in children had diminished. The really great reform in sanitary matters in recent years in Dublin is the improvement in the tenement houses of the poor. The last Census Commission has shown this. There has been a great diminution in 4th-class houses and a great increase in the number of 1st and 2nd-class houses. With regard to the removal of refuse, he pointed out that the night-soil was not removed, but was sent down water-closets connected with imperfect drains, which allow matter to trickle into the subsoil. On account of this, typhoid fever has been increasing. Ashpits would be better than these imperfect drains.

Dr. Byrne thought that the removal of filth was greatly superior to placing it in ashpits for some time.

The President said that it was very unfortunate that, when closets were substituted for privies, the drains were not made perfect. He had seen the pail system in another town, and he would be very sorry to see it introduced here. Another objection to it would be the large number of different families living in the same house.

Dr. Flinn stated that when he was writing the paper he had the country towns principally in his mind. He thought that the statement of the Medical Officers of Health for Dublin, Belfast, Cork, and Kingstown—that they believed the cases of zymotic diseases had decreased in number owing to the improved method of public cleansing—was very convincing. He had great belief in the pail system; he had seen it employed for two years with great success in England. The pails were emptied in the early hours of the morning. He thought that the pails ought to be provided free of charge to the poorer class of people.

HOOPING-COUGH AND MEASLES AS NOTIFIABLE DISEASES.

By JOHN MARSHALL DAY, M.B. Univ. Dubl.;
Resident Medical Officer, Cork-street Fever Hospital, Dublin.

[Read in the Section of State Medicine, April 28, 1893.]

Early in April, 1893, I got a notice from the Public Health Committee stating they had added to the eleven already notifiable diseases two more—namely, measles and hooping-cough.

Now few, I think, will cavil at the first disease being added, as practically it has been treated by most of the health officers as a dangerous infectious disease and sent to hospital from the various tenement houses and institutions in the city. But why, when putting measles on the list, did they not add its foster brother Rötheln, commonly called German measles; by not doing so they have left a loophole for the avoidance of notification, if any person be so disposed; also it is not the simple disease we used to consider it in days gone by; and lastly, its appearances are so deceptive that mild scarlatina and ordinary measles have been frequently mistaken for it with bad results. Methinks this judgment was founded on the same error that made variola a notifiable disease and over-looked varicella, which at times it is nearly impossible to diagnose from the modified form of the former disease.

Now, the pertinent question is, why do they notify diseases and send them to hospital or isolate them or disinfect? Evidently for the purpose of stopping the spread of the disease, and, if possible, lessening its virulence. I think it is now generally admitted as an axiom that this Act cannot be

carried out without proper hospital accommodation for the diseases mentioned in the schedule, as all over England they are at present building isolation hospitals.

2nd fact admitted. All cases should be isolated and reported.

3rd fact. Isolation must be continued as long as it is possible to convey infection, although many will escape detection. It is not the poor so much as the better class of people that keep up an epidemic of scarlatina or measles by not continuing quarantine long enough.

And finally. The cost of isolation and hospital treatment should not be greater than the benefits gained thereby. Having allowed these points, we shall consider how hooping-cough, as a notifiable disease, is affected thereby.

Hooping-cough, according to Hirsch, is exquisitely communicable. Smith, in his treatise, says it is eminently contagious, and Ashby and Wright, whose experience of this disease in Manchester is very great, say passing an infected child in the street is sufficient to communicate it; and if one case occurs in an alley or laneway, it is tolerably certain to spread to all fit subjects. Von Ziemssen says the dry sputa are infectious, and quoting Letzerich, who described a fungus in connection with this disease, also speaks of the long life, reproductive power, and infectious nature of the materies morbi.

Lastly and not least, it is endemic in Ireland, according to Hirsch—a statement in accordance with, I believe, the experience of most medical practitioners in Dublin.

In order to show the nature, persistency, and endemic properties of this disease, we will proceed to analyse the Dublin death-rate for the ten years ending with 1891. If we consider the average rate founded on the number of cases certified as dying of hooping-cough, we find it 5·2; that of scarlatina and measles respectively 5·5 and 4·4; but if we

compare the individual annual averages we find that whilst measles varied from 16·3 in 1882 to ·1 in 1891, and scarlatina from 10·5 in 1884 to ·1 in 1890, hooping-cough never fell below 2·3—that was in 1887—although it rose in 1883 to 9·5. Of course we recognise the fallacy underlying this basis, because the high death-rate may be due to increased virulence in the type of disease and not increased prevalence. If we take up the 5 decennial periods in England from 1841 to 1890 we find the death-rate varied only from 8·7 to 6·9 per 10,000. As regards its connection with diseases of the lungs and respiratory passages we find, in 1887, the deaths from these diseases were high, and deaths due to hooping-cough were below the average; in 1891 the exact converse took place.

We find the sequence of measles and hooping-cough well marked. In 1882 we had 567 deaths from measles, and in 1883 333 deaths from hooping-cough, and if we were to examine the quarterly returns we should find that they overlapped each other. Again, in 1885 and 1886 matters were repeated, and again on a lesser scale in 1887–8. To sum up and make a comparison, we find the following facts evident: Hooping-cough is always prevalent; it increased either in numbers or in virulence just after and overlapping an epidemic of measles: it preceded scarlatina epidemics twice—viz., in 1883–4 and 1886–7; its prevalence never dies away like measles and scarlatina; and when we consider Hirsch's statement that its death-rate is fairly constant, we must assume that the numbers affected are fairly constant also.

Now, will many of these cases be sent to hospital in the ordinary course of events? We must answer that question in the affirmative, because we find, taking averages of classes and averages of deaths from hooping-cough, that it is six times as prevalent amongst the classes that seek hospital

treatment as amongst the upper classes. Secondly, we may certainly assume that, judging from the death-rate, either each year the number of severe cases will be large if the death-rate be due to a bad type, or the number needing isolation and removal from home or institutions will be large, even if the death-rate is caused by extensive prevalence of a mild type.

Now, preventive measures against endemic or even epidemic disease of this nature—highly infectious, long duration, difficult of diagnosis—to do any good and not bring themselves into disrepute, must be thorough, efficient, and administered with an impartial hand, visiting with admonitions and penalties rich and poor alike.

It were no good to harass the poor people with doctors' notices, inspectors' visits, disinfecting cabs, &c., unless you can give them some benefit which they can see and appreciate.

They may say we keep them from school and disinfect the rooms when the case is well, and we prevent them being with healthy children in institutions; that is all very well, but it is perfectly useless. Will you prevent them playing together? When is a case incapable of conveying the disease? Will you prevent them from entering railway carriages, trains, theatres, &c.; and how will you deal with the fact that at least twenty per cent. of hooping-cough cases are never recognised? In fact, it is so well known abroad that the French have a special name for those cases which present no definite symptoms of hooping-cough except that they are infectious—namely, "Coqueluchette."

We will now consider the suitability of these patients for hospital treatment. Ashby and Wright state that it does not spread in hospital wards, but Rogers says it does; and I remember three distinct epidemics which spread from one case accidently introduced into a children's hospital,

where nearly all the country children were infected; in fact, I believe the only ones that escaped were those children who were protected by former attacks. Hence we must conclude that isolation in hospital is necessary. And when we consider that if epidemics are concurrent, or, at least, overlap epidemics of measles, a disease, which except cholera, affords the greatest number of cases in the shortest time, where can we accommodate at such time measles, hooping-cough, and measles with hooping-cough?

Secondly, the duration of hospital treatment is very long. Hirsch says eight to ten weeks, often three to four months, in fact it may go on for a year. Barthez and Rilliet agree with this statement. The duration of cases with us admitted from institutions and treated to recovery was nine weeks, and it is often very difficult to say when you may discharge them. Lastly, it is not so severe a disease as is generally thought. Henoch places it fifth in the mortality columns of epidemic diseases. Also the vast majority recover health. With us only one child over three years of age died; he was a consumptive child of consumptive parents.

For these reasons I think the Public Health authorities cannot expect to cope successfully with hooping-cough with their present accommodation and resources. They are not trying to expel an invader or prevent his ravages, but they are attacking an enemy in their midst, who, although he never shows great strength of numbers, still carries on a guerilla warfare with a tenacity of purpose and constancy of attack against which they are powerless, no matter how vigilant their scouts, *i.e.*, the Medical Officers of Health, may be, unless they are prepared to aid in a liberal method the present isolation hospital accommodation in Dublin, and so follow the example of London authorities, who have materially lessened the death-rate from scarlatina by rigid isolation in hospital of most of the cases. The question

whether treatment of these cases in hospital is a benefit to the children in question, and whether the evils arising from neglected complications that so often entail permanent injury, and end by making the subjects permanent charges on the rates from their inability to earn their own livelihood, I have carefully avoided as not coming under the scope of this question, and as being too involved to be included in this paper; still, it might be worthy of consideration on some future occasion.

Dr. J. W. Moore said he thought that Rötheln and varicella should be included under the list of notifiable diseases, owing to the difficulty of distinguishing them in the early stages from measles and variola respectively. One of the chief objects in notifying diseases was with a view to the removal of the cases to hospital; but there was another—namely, to ascertain the number of cases of infectious diseases occurring in a district. He did not think that children in hooping-cough would be benefited by a stay in hospital, as they needed abundance of fresh air. Some time ago he had heard Dr. Duffey speak in high terms of praise of thiocamf in the treatment of this disease. It set free sulphurous acid on exposure to air, and might be used internally, externally, or as an aërial disinfectant. He wished also to point out that the death-rate was not a trustworthy test of the prevalence of a disease, as some epidemics might be mild and others severe, and in the case of hooping-cough the death-rate would be largely influenced by the weather.

Dr. Delahoyde said he always endeavoured to have both true measles and German measles removed to hospital. An extension of hospital accommodation for children was greatly needed. Many parents objected to letting their children go to hospital on account of insufficient accommodation.

Dr. Byrne said that, owing to the very infectious nature of measles in the incubation stage, for the prevention and isolation of measles, it would be necessary to remove also all the junior members of a family, one of whom happened to be affected. He did not believe mothers would bring children suffering from hooping-cough to doctors if they knew the cases had to be notified.

Dr. Oulton stated that he believed the Notification Act was badly managed, because medical men as a body did not act according to its requirements. A doctor who did so might become unpopular and damage his practice, owing to the dislike the parents had to have the cases notified. If medical men as a body acted up to the requirements of the Act there would be no trouble on this account.

Dr. Flinn said that the Act would never be properly carried out till some medical men were prosecuted for failing to comply with it.

Dr. Parsons said he thought that, from a scientific point of view, the notification of measles and hooping-cough would be a benefit, but that there would not be much practical advantage, owing to there not being space for the cases, especially if Dr. Byrne's suggestion were acted upon. Another difficulty would arise in regard to the length of stay of the cases in hospital.

The President stated that he had been residing in Huddersfield, where compulsory notification was the law, and was also carried out, and he never found any trouble among the people. He thought prosecution to be the only remedy for failing to comply with the Act, especially if some leading member of the profession were the person summoned. He thought that, in hospitals where there were special wards for particular diseases, measles was treated in what was practically a children's ward.

Dr. Day, in reply, stated that parents were losing the objection they formerly had to sending their children to hospital. The real objection they had was to the after-disinfection of their rooms. Ordinary cases of hooping-cough were not usually taken into hospital unless suffering from complication.

SECTION OF ANATOMY AND PHYSIOLOGY.

DELIMITATION OF THE REGIONS OF THE ABDOMEN.*

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[Read in the Section of Anatomy and Physiology, January 6, 1893.]

PART I.—PLANES OF DELIMITATION.

In our endeavours to obtain a rational and a convenient method of subdividing the abdomen into regions, it is essential that we should keep clearly before us certain elementary points in the construction of the abdominal wall. In the upper part of the cavity the viscera are partially protected by the lower costal arches, and in its lower portion, to a less degree, by the iliac bones, whilst between these regions there is usually a narrow belt of abdominal wall which receives no skeletal support beyond that which is afforded to it by the vertebral column. This fundamental conception of the construction of the abdominal wall forms the basis upon which the majority of anatomists have proceeded in their attempts to find a proper method of sub-dividing the cavity. The loose and unscientific manner,

* This paper gives the substance of a Report which was submitted to the Committee appointed by the Anatomical Society to consider the question of the Delimitation of the Abdomen. The Report was accompanied by models of the liver, right kidney, and second part of the duodenum, which had been constructed with the view of illustrating their true shapes, and also their topography within the abdominal cavity.

however, in which this idea has been acted upon has been most ably pointed out by Professor William Anderson.[a] The scheme proposed in Quain's Anatomy alone carries out the idea to its logical conclusion. In this scheme the two horizontal lines which are employed traverse the lowest points of the thoracic wall and the highest points of the iliac crests respectively. These lines may be termed the *subcostal* and the *supra-iliac lines*. Two objections may be raised to this method of delimitation. One of these is altogether insuperable—viz., that in certain cases the two lines actually coincide, so that an umbilical or intermediate zone does not exist. The second objection has been referred to by Professor Anderson: the umbilicus, which gives its name to the intermediate zone, may not lie altogether within it.

In sixteen subjects, comprising nine males and seven females, I have tested the relationship which exists between the subcostal and supra-iliac lines. In two (one male and one female) they coincided, whilst in the others the distance separating them varied from half an inch to two and a quarter inches. In the nine males the average distance was one inch; in the six females it was 1·2 inches. The position of the umbilicus with reference to the supra-iliac line varied slightly. In only one case did it lie altogether above the line. In the others the line grazed its upper border, or its lower border, or passed through its midst.

The cause of this variation in the relationships presented by these two lines is not far to seek. The supra-iliac line is fairly constant in its level. The variation is produced by a rise or fall of the subcostal line; in other words, the lateral depth of the thoracic wall varies considerably in different subjects, and in males there is reason to believe that it is relatively deeper than in females.

[a] Journal of Anatomy and Physiology. Vol. XXVI., p. 543.

It is obvious, therefore, that if we decide upon retaining the three regional zones of the abdomen we must discard one or other or both of the lines proposed in Quain's Anatomy. Professor Anderson seems inclined to abolish the intermediate zone altogether, and to employ only one horizontal plane of sub-division. This, he proposes, should pass through the umbilicus. I am loath to adopt this mode of escaping the difficulty. There is a very great convenience in the old method of sub-division: it is fundamentally correct in principle; and further, it has sunk so deeply into our terminology, and taken so firm a hold upon all who have

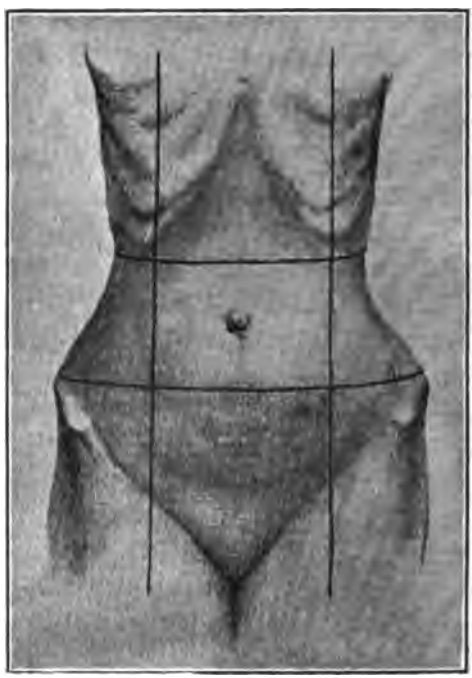


FIG. 1.—From a photograph of a female subject in the erect posture. The points between which the inter-tubercular and subcostal lines are drawn are well seen. The mid-Poupart lines were ascertained by dropping two plumb-lines from a height.

studied anatomy, that it would be exceedingly difficult to uproot. Professor Anderson himself is keenly alive to these objections to the scheme, and does little more than merely hint at it. I believe that a change of so radical a kind would for many years give rise to greater confusion than that which exists at present. Let us rather see if we cannot improve upon our present method, and bring it within the area of accuracy and truth.

Although the most variable in regard to its relative level, I am of opinion that we should retain Quain's subcostal line. One alteration I would suggest, however—viz., that this plane should pass through the abdomen at the level of the most dependent point of the tenth costal arch, *i.e.*, the lowest of the fixed ribs. The eleventh rib being a floating rib, and moreover very variable in length, it is well to discard it altogether. Further, the lowest point on the tenth costal arch is always easily ascertained, and lies in front of the lateral line of the trunk, which is a distinct advantage. In many cases, indeed, it can be detected by the eye.

The subcostal plane so fixed, in a young male subject six feet in height (in which the supra-iliac plane was placed 2¼ inches lower down), passed through the upper part of the body of the third lumbar vertebra (*vide* tracing 4, Plate I.).

It is the supra-iliac plane that I propose, therefore, that we should abandon. At the same time I am not prepared to adopt a plane passing through the anterior superior spines of the iliac bones. This would throw the greater part of the iliac fossa on each side into lumbar region, and constitute an extremely artificial method of delimitation. But to my mind the chief objection to such a plane consists in the fact that it passes through the sacrum so as to include in the intermediate or umbilical zone the upper part of the true pelvis. I should imagine that few anatomists could be

prepared to abandon the natural and convenient primary sub-division of the abdominal cavity into *abdomen proper* and *true pelvis.*

Every anatomist is familiar with a prominent tubercle which juts out from the outer lip of the crest of the ilium about two inches behind the anterior superior spine. It constitutes the upper extremity of the strong bar of bone which extends upwards in the ilium from the upper part of the acetabulum, and which forms the convexity of the concavo-convex surface of the dorsum ilii. As a prominence it is usually better marked on the surface of the body than the anterior superior spine of the ilium, from the fact that when the body is viewed from the front it is the point on the iliac crest from which the outline of the flank starts. It is therefore placed on the outer aspect of the highest part of the iliac crest that is seen from the front in the living subject. It is true that the iliac crest rises to a higher level behind, but this higher point is not seen from the front, and can only be determined with exactitude when the subject is turned on its side.

I would suggest that this conspicuous tubercle on the crest of the ilium should be used as giving us the level at which we should place the lower plane of abdominal sub-division. By drawing a line between two points situated one on each crest of the ilium immediately above the iliac tubercle, the level of the plane may be readily obtained.

But there is abundance of proof to show that this is no new suggestion. It is merely a more exact mode of expressing what other anatomists have meant all along. When the editors of Quain speak of the highest point of the crest of the ilium, they in reality mean the highest point as seen *from the front*, and not as seen *from behind;* in other words, the level which is expressed by our *inter-tubercular line.* In evidence of this, look at the figure which they give to illus-

trate the delimitation of the abdomen. Their lower line passes between the two iliac tubercles in question, the two points at which the outline of the trunk meets the crest of the ilium. The loose way in which anatomists have described this line has also led to the confusion which has arisen in connection with the position of the umbilicus with reference to the lower plane of abdominal delimitation.

The inter-tubercular line is an exceedingly convenient one, not only on account of the ready and exact manner in which it can be applied both in the living and the dead, but also on account of its affording us a really useful plane of

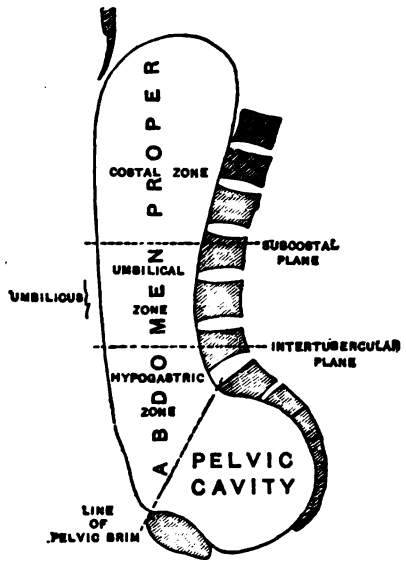


Fig. 2.—Outline of the abdominal cavity as seen in mesial section. The horizontal planes of sub-division are indicated by dotted lines.

delimitation. The only objection to it is that it cuts off and transfers to the umbilical zone about 1¼ inches of the highest part of the iliac fossa. It traverses the vertebral column so as to divide the body of the fifth lumbar vertebra into two nearly equal parts. Behind, it emerges from the body of

this vertebra at its postero-inferior margin (*vide* tracing 4, Plate II.).

Let us next inquire into the extent of the regions which are thus marked out by the subcostal and the inter-tubercular lines. Owing to the varying level of the subcostal plane the breadth of the umbilical zone shows considerable differences in different subjects. Seven females gave an average breadth of 2·7 inches; nine males gave exactly the same results. The narrowest area noticed was in a female subject, in which it measured 1½ inches; the broadest zone in a male subject, in which it measured 4 inches. The following table shows the breadth of the umbilical zone in each of the twelve subjects examined :—

Breadth of the zone between the subcostal and inter-tubercular lines in sixteen subjects :—

Males.	Females.
2 inches.	1½ inches.
2 ,,	2½ ,,
2¼ ,,	3 ,,
2¼ ,,	3 ,,
2½ ,,	3 ,,
2½ ,,	3 ,,
3 ,,	3½ ,,
3½ ,,	
4 ,,	

The umbilicus always lies within this zone, and presents a fairly constant relation to the inter-tubercular line. As a rule, it lies from 1¼ to 1½ inches above it.

In the same sixteen subjects, I have also ascertained the depth of the costal and hypogastric zones, as measured along the middle line in front. The costal zone, measured from the lower border of the gladiolus of the sternum to the subcostal line, gave an average in the seven females of six inches; and in the nine males I obtained an exactly similar average. In the case of the hypogastric zone, measured

from the inter-tubercular line to the pubis, the average depth was again precisely the same in the two sexes—viz., five inches.

The three zones, therefore, which are mapped off by the two horizontal lines in question, present the following average depths:—

	Males.	Females.
Costal zone,	6 inches.	6 inches.
Umbilical zone,	2·7 „	2·7 „
Hypogastric zone,	5 „	5 „

It is a curious coincidence that in the two sexes the average depth of each zone should have turned out in the sixteen subjects examined exactly the same. It must be remembered, however, that these are absolute results, and that if we take into account the greater height of the males, the relative depth of the abdomen in the females must have been greater than in the males. How far this may be considered to be the rule I am not at the present moment prepared to say,[a] but this much we do know—viz., that the lumbar section of the vertebral column in the female presents a greater relative length than the corresponding part of the column in the male, whilst the dorsal region is relatively shorter. Taking the entire length of the column as 100, the relative length of the dorsal and lumbar sections of it in the female are 45·8 and 32·8; and in the male, 46·5 and 31·7.[b]

I have referred to the rise and fall of the subcostal line produced by variations in the lateral depth of the thoracic wall in different subjects. It may be well to state here definitely that this is not due to differences in the level at which the ribs are attached to the vertebral column. The

[a] In connection with this point, we should not lose sight of the fact that there is reason to believe that the sternum of the female is relatively shorter than that of the male.

[b] Cunningham Memoir. Royal Irish Academy. No. 2, p. 80.

absolute length of the lumbar section of the vertebral column, even in individuals of different heights, is very constant. In six males I found the average to be 7 inches, and only two of the spines varied from this average—one to the extent of $\frac{1}{8}$ of an inch, and the other to the extent of $\frac{1}{4}$ of an inch. In female spines the same constancy in the lumbar section of the column is observed. The average absolute length in six spines was $6\frac{1}{2}$ inches, and the variations from this did not exceed half an inch[a].

It is clear, therefore, that the rise and fall of the subcostal line in different individuals is brought about by differences in the slope and in the length of the ribs. In the females it did not appear that tight-lacing materially affected the position of the subcostal line.

So far as the vertical lines of subdivision are concerned, I do not think that we could improve upon those in general use—viz., two perpendicular lines reared from the mid-points of Poupart's ligaments. The two planes which are thus indicated on the surface may be termed the "right and left mid-Poupart planes."

Whilst I would, therefore, recommend the retention of these lines, I must not be understood to imply that they are altogether free from objection. The two sides of the body are not often absolutely symmetrical. Thus it will be frequently found that these lines strike the lower margin of the chest at different points on the two sides, and at different points in different subjects. Further, it will sometimes be seen that the districts to the right and left of these lines are not of equal extent. So far as my experience goes, it would appear that the left district (composed of left hypochondrium, left lumbar region, and left iliac region) is in certain

[a] These measurements were made on tracings obtained from frozen spines divided in the mesial plane. The lumbar part of the column in each case was measured in a straight line from the antero-superior corner of the first lumbar vertebra to the antero-inferior corner of the fifth lumbar vertebra.

cases distinctly smaller than the corresponding district on the right side. Lastly, the mid-Poupart lines leave us with a very wide district between them. This, however, is no great objection, as the mesial plane affords us an excellent means of subdividing it into a right and left portion.

The employment of oblique lines, or the curved lines suggested by Dr. Wilberforce Smith (viz., the outer border of the rectus abdominis), would in my opinion only lead to confusion. When an artist is desirous of reproducing a sketch in exact proportion, he does not draw oblique lines upon the paper which is to receive the drawing, but a series of horizontal and vertical lines. The same applies to the abdomen. It is easier for us mentally to map in the position of the viscera with reference to a "chess-board" arrangement of lines, than with reference to a series of oblique or curved lines. To the *linea seminlunaris* I would urge certain special objections—viz., (1) it is not always marked on the surface of the abdomen; (2) it is not a fixed line, but varies with the development of the rectus abdominis muscle, and in the female it is extremely variable from other causes; (3) the lateral district which it would map out would be very much too wide in its lower part, whilst in its upper part the hypochrondriac region would in certain cases be so narrow that it would be absolutely useless to recognise it as a separate subdivision.

PART II.—TOPOGRAPHY OF THE VISCERA.

It is not only necessary to fix upon planes of delimitation, but, as Professor Anderson has remarked, it is also requisite that we should know the structures that are divided by these planes, and also those that lie in the regions which are marked out. The observations which I have to offer on this aspect of the question are derived entirely from the examination of one subject, but when these are compared with the

results obtained by other anatomists, a close correspondence will be remarked. I consider, therefore, that we may provisionally regard them as affording us that "regional type" to which Professor Anderson alludes, and which he rightly says "would be of material service in medical education."

It is now nearly four years ago since I resolved to make a series of sections through the frozen abdomen along lines and planes which would enable us to accurately localise the viscera in the different regions of the cavity. For some time I was unable to carry out this project, because no suitable subject presented itself. For the success of the scheme it was necessary that we should obtain a well-developed healthy body. At last an opportunity occurred. A well-built male, about thirty years of age, who had committed suicide by the clumsy method of cutting his throat, was brought into the school. He was six feet in height, rather spare but not emaciated, and so far as our superficial inspection went, he seemed to be healthy. It afterwards turned out that we were not quite correct in our surmise as to the healthy condition of all the internal organs. There were cavities in the lungs, tubercular disease of the vesiculæ seminales, &c. The abdominal organs, however, were perfectly sound. Having placed the body on its back, so that an accurate mesial section could afterwards be made, it was frozen entire in the ordinary way. Unfortunately, without due forethought, the left thigh was slightly flexed and adducted. This produced a small degree of tilting of the pelvis to the opposite side, the effect of which will be seen later on, when the sections come to be studied. In four days the subject was ready for section. After the removal of the head and limbs, a series of horizontal sections were made through the upper part of the trunk down to a level a short distance above the nipples. The lower part of the pelvis was then

removed by a horizontal cut at the level of the pubic crests. The portion of the trunk which remained included the whole of the abdomen, with the exception of the lower part of the pelvic cavity.

A series of sagittal sections were made through this abdominal block. Three of these were planned so as to pass through the right and left mid-Poupart planes and the mesial plane. Each of the four slabs thus obtained was still further subdivided in a vertical sagittal direction into two as

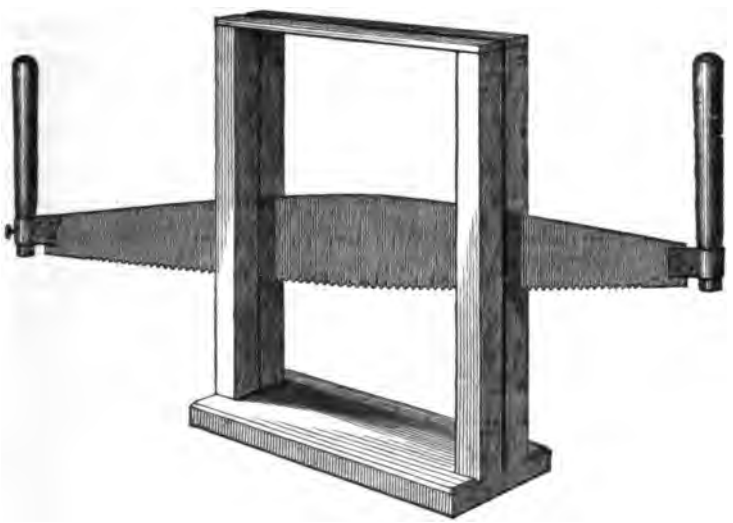


Fig. 3.

nearly equal parts as possible. These sections were made with a fair amount of success. Owing to the slight degree of tilting of the pelvis, the portions of the innominate bones cut in the mid-Poupart planes differ to some extent. Further, the sections to the right of the mesial plane deviated to a small degree from the accurate sagittal direction which we had proposed the saw should follow. The apparatus which I employ to ensure that the saw will follow a desired

plane was too small to take in so large a block, and as we proceeded in our section-cutting from left to right, the portion still remaining to be cut became so narrow that it was an exceedingly difficult matter to obtain absolutely accurate results.

The stomach and intestinal canal were empty, and the abdominal wall in consequence was much retracted. In the mesial plane opposite the umbilicus, the antero-posterior diameter of the cavity was only one and a quarter inches.

It will be most convenient to indicate, in the first place, the parts cut through in the two mid-Poupart planes of section, and then localise the viscera in the different regions.

Left mid-Poupart Plane.—The saw passed very accurately through this plane. Owing to the slight tilting of the pelvis, the innominate bone is cut behind about a quarter of an inch too far out. In place of passing through the pelvis, as it should have done, half an inch to the outer side of the sacro-iliac joint, the saw traversed the bone about three quarters of an inch to the outer side of the articulation (tracing No. 6, Pl. II.).

The structures divided in this plane are—(1) the spleen, so that at least one-third of the organ lies to right, and two-thirds to the left of the plane of section; (2) the empty stomach, through the greater part of its length; (3) the liver, one and a half inches from its left extremity; (4) the left kidney, so that by far the greater part of the organ lies to the right of the plane of section; (5) the colon in four different places—viz., at the summit of the splenic flexure, the termination of the transverse colon, the commencement of the descending colon, and the sigmoid flexure; (6) some coils of the small intestine.

Right mid-Poupart Plane.—When the tracing (No. 2, Pl. I.) which shows the parts cut in this plane is compared with that which shows the structures cut in the left mid-

Poupart plane, it will be noticed that the portion of the innominate bone divided differs considerably. Indeed, on the right side the saw has passed through the outermost part of the sacro-iliac joint—*i.e.*, half an inch too far in. This is partly due to the tilting of the pelvis already referred to, and partly to a slight deviation of the saw inwards as it was carried backwards through the trunk. It will be also noticed that the outer portion of the psoas muscle is sliced off. The section should have passed to the outer side of this, and divided the muscle only in the neighbourhood of Poupart's ligament.

The parts divided in this section are seen in tracing No. 2 (Pl. I.), which was taken from the surface of the slab which lay to the right of the plane of section:—(1) The liver bulks most largely in this section. It is cut immediately to the right of the gall-bladder; indeed, the gall-bladder has suffered somewhat by the section. The saw has passed through its right wall. (2) The kidney is divided so that very nearly two-thirds lie to the right of the plane of section—only one-third to the left of it. (3) The hepatic flexure of the colon is cut at the point where it is giving place to the transverse colon. (4) Curiously enough, the only part of the small intestine divided in this plane of section is the terminal part of the ileum. This part, about four inches in length, is seen in the slab which bounds the plane of section on the right, passing vertically upwards on the psoas. Had the section passed accurately backwards through the mid-Poupart plane, a much smaller portion of the ileum would have been seen in this slab.

Instead of giving a catalogue of the viscera contained in each region, our purpose will be better served if we describe the position of each viscus, with reference to the planes of subdivision that we have chosen. In the tracings taken from the surface of the slabs, the three horizontal lines

indicate the subcostal, supra-iliac, and inter-tubercular planes. It will be remembered that the last-mentioned plane is the one which has been selected as the lower boundary of the umbilical zone. In this subject the intermediate zone measured four inches in depth—*i.e.*, between the subcostal and inter-tubercular planes.

Kidneys.—A considerable difference is noticed in the position of the two kidneys. The position of the *right kidney* is shown in tracings Nos. 1, 2, and 3 (Pl. I.). In these it is seen to be sunk deeply into the posterior surface of the liver. About two-thirds of the organ is placed in the hypochondriac region, and one-third in the epigastric region. The subcostal plane crosses its lower end, so as to cut off a portion not exceeding a quarter of an inch in length. This is the only portion of the right kidney which enters the lumbar and umbilical regions.

The *left kidney* in the subject under consideration, is for the most part contained within the epigastric region. Rather less than one-third of the organ lies to the left of the mid-Poupart plane in the hypochondrium. Its position may be studied in tracings Nos. 5 and 6 (Pl. II.). It will be seen that its lower end does not reach the subcostal plane.

The fact that only on the right side did the kidney enter the lumbar and umbilical regions was to me a matter of surprise. In the admirable sketches given by Dr. Symington to illustrate the true position and shape of the liver and kidney, a somewhat similar condition will be seen. In plate IV. of his work[a] both kidneys appear to be placed above the level of the subcostal plane. In the subject at present under consideration, the kidney is separated from the highest point of the iliac crest by an interval of two inches. The variability which is exhibited in different subjects as to the width of this interval formed the subject of a Report from the Committee of Collective Investigation. This variability goes hand in hand with the variations which we have noted in the lateral depth of the thoracic wall. The kidneys rise and fall with the rise and fall of the subcostal plane.

A model of the right kidney in this particular subject was submitted to the Committee. The form is somewhat different from

[a] On Certain Physiological Variations in the Shape and Position of the Liver. Trans. Med. Chir. Soc. Edin. 1887. Plate IV.

that which we are in the habit of regarding as peculiar to the kidney. But into this we need not enter at present.

Liver.—(See tracings Nos. 1 to 7).—A model which exhibits the true shape of the liver in the subject under consideration also accompanied this Report. It must be remembered that the stomach and great intestine were empty. This partly accounts for the differences in form which are seen to exist between this model and that prepared by Professor His. The inferior surface, as described by His, in my model looks directly backwards, and the antero-posterior diameter of the liver is greatly reduced. All this is due to the empty state of the hollow viscera in relation to it, and also to the consequent retraction of the abdominal wall. These conditions, however, would only exercise a partial influence in altering the relations between the liver and kidney. In the model prepared by His, the renal impression looks downwards and is a shallow fossa; in the model submitted to the Committee, the renal impression will be seen to be a deep excavation, which looks directly backwards, and into which the entire kidney is sunk. I was prepared for this from the study of a series of transverse sections in my possession. Symington has also called attention to the same point, and has figured a similar depression in the liver. It is important to note also that his observations were made on a subject in which the stomach was distended. The model of His, therefore, clearly requires some modification in this respect.

The position of the liver is seen in the various tracings submitted to the Committee. The organ lies in all the three regions of the costal zone. The portion which lies in the left hypochondrium is represented by one inch and a half of the extremity of the left lobe. The right surface is very steep and long, and extends downward into the lumbar region for about one inch (see tracing No. 1, Pl. I.). Here the liver attains a lower level than the lower end of the kidney. Symington has observed a similar relationship, but is inclined to regard it as being due to an increase in the vertical diameter of the right lobe of the liver brought about by the compression produced by a distended stomach.

The different parts of the liver which occupy the three regions of the costal zone are exhibited in the accompanying outline sketch of the model referred to (Fig. 4).

Amongst the many interesting points to be noted in connection with this model of the liver we may specially mention—(1) the intimate relationship between the right lobe and the kidney, already

referred to; (2) the small extent of the impression for the empty stomach; (3) the large size of the tuber omentale; (4) the marked depression for the œsophagus; (5) the depression on the inner part of the tuber omentale corresponding to the injected cœliac axis and the grooves leading away from this, which indicate the course taken by its three radiating branches.

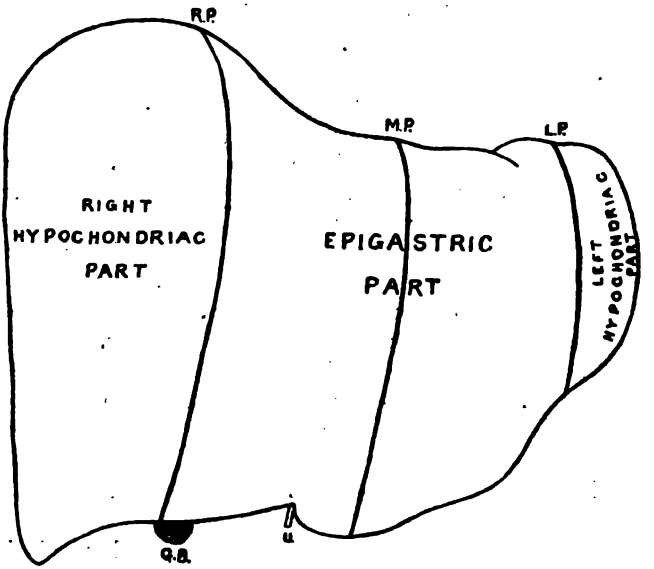


FIG. 4.—Outline obtained from a tracing of a photograph of the model constructed from the liver.

R.P.—Right mid-Poupart plane; M.P.—Mesial plane; L.P.—Left mid-Poupart plane; G. B —Gall Bladder; U.—Ligamentum teres.

Gall Bladder.—(Tracing No. 2, Pl. I.)—The gall-bladder lies lies in the epigastric region close to the right mid-Poupart plane, and even encroaches to a very slight extent beyond this plane into the hypochondriac region. The fundus approaches the subcostal plane, but is separated from it by an interval of rather more than half an inch.

Stomach.—(Tracings Nos. 4, 5, 6.)—With the exception of a little mucus the stomach was empty, and its lining mucous membrane was thrown into a series of infoldings which almost completely obliterated its cavity. The left mid-Poupart plane passes through the stomach about half an inch to the left of the lesser

curvature. Very nearly equal portions of it lie in the hypochondriac and epigastric regions. It is seen that the greater part of the stomach, in its empty condition at least, is very nearly vertical in its direction. Placed in the interval between the liver and spleen, it extends downwards, with a slight inclination forwards and to the right (tracing No. 6). This vertically-placed portion of the organ may be said to comprise very nearly three-fourths of its bulk. The pyloric fourth is horizontal, and lies in the epigastrium, partially overlapped by the thin edge of the left lobe of the liver (tracing No. 5). The pyloric opening corresponds accurately with the mesial plane (tracing No. 4), where it lies completely under shelter of the liver, half an inch above the subcostal plane, and $4\frac{3}{4}$ inches below the lower end of the gladiolus. The œsophageal opening lies a short distance to the left of the mesial plane.

Spleen.—About one-third of the upper and inner part of the spleen lies in the epigastrium; the remaining two-thirds occupy the left hypochondrium (tracings Nos. 5, 6, 7, Pl. II.).

Suprarenal Capsules.—These are both placed high up in the epigastric region.

Pancreas.—The pancreas is almost entirely placed in the epigastrium; its tail crosses the left mid-Poupart plane and enters the hypochondriac region.

Duodenum.—The first part of the duodenum has a position very similar to that exhibited in figure 2 in Dr. Symington's article upon the liver. It lies entirely in the right part of the epigastric region, completely under shelter of the liver, and in relation to the lobulus quadratus, the gall-bladder, and the parts entering the transverse fissure (tracings Nos. 3 and 4). It ascends slightly as it passes to the right. Thus at its commencement it is only half an inch above the sub-costal plane, whilst at its termination it is one inch above that level.

The second part of the duodenum (tracing No. 3) descends into the umbilical region. The right mid-Poupart plane grazes its convexity, but does not open into it. It is moulded on the convex surface of the psoas, and merely touches the lower end of the kidney. In a distended condition it would, no doubt, lie in front of the kidney.

The third part of the duodenum crosses in front of the vertebral column in the umbilical region. In the mesial plane (tracing No. 4) it lies in front of the third lumbar vertebra, and immediately below the subcostal plane. Lastly, ascending into the epigastric region,

it ends on the left side of the second lumbar vertebra. The jejunum is divided close to its commencement in the epigastric region in the section midway between the mesial plane and the left mid-Poupart plane (tracing No. 5).

Even in absolutely normal conditions, the relations presented by the duodenum and the kidney are seen to be very different in different subjects. Dr. Brooks, who has studied this question, has kindly supplied me with three drawings which illustrate this point (Fig. 8, Pl. II.). In one of these the duodenum is related to the upper end of the kidney; in another it overlies the inner part of the kidney throughout its whole length; in the third it merely touches its lower end, as in the subject at present under consideration.

This variability in the mutual relations exhibited by these two organs is a matter of very great interest, and I believe that it is due to changes in the position of the kidney. We have seen that the kidney moves up and down with the rise and fall of the subcostal plane; in other words, its position is affected by the lateral depth of the thoracic wall. In health the duodenum, however, is very constant in its position. It is moulded on the vertebral column, and its position is in no way influenced by those conditions which affect the level of the kidney. If I am right in these views, it would be possible to foretell by an examination of the exterior of the body and by the determination of the level of the subcostal plane, the relative position of the kidney and the duodenum.

Coils of Small Intestine.—With the exception of the terminal four inches of the ileum, there is no part of the small intestine placed to the right of the right mid-Poupart plane. The coils of the small intestine chiefly occupy the hypogastrium; but they are also found in the umbilical, left lumbar and left iliac regions, whilst a small portion of the jejunum ascends into the left hypochondrium.

The terminal four inches of the ileum passes vertically upwards on the psoas in the right iliac fossa (tracing No. 2) immediately to the right of the mid-Poupart plane, and ends in the cæcum at the level of the inter-tubercular plane.

Cæcum.—The cæcum lies almost entirely in the right iliac fossa. The ileo-cæcal opening is placed immediately above the inter-tubercular plane. When distended, the cæcum no doubt encroaches further into the right lumbar region. Indeed, Symington has recently figured the ileo cæcal valve in the distended gut at the

level of the disc between the fourth and fifth lumbar vertebræ,[a] *i.e.*, three-quarters of an inch above the inter-tubercular plane.

Colon.—The ascending colon proceeds vertically upwards in the right lumbar region until its progress is arrested by the liver. The hepatic flexure takes place at this point, but only a very small portion of its summit is in the right hypochondrium (tracing No. 2). The subcostal plane cuts off about one inch of its highest part. From this the transverse colon descends and enters the umbilical region (tracing No. 3), across which it may be traced into the left lumbar region. It reaches its lowest level in the mesial plane (tracing No. 4), where it lies rather more than half an inch below the subcostal plane. It gains the level of the subcostal plane in the left mid-Poupart plane, and immediately turns upwards into the left hypochondrium (tracing No. 6). In this region it attains a position in the interval between the stomach and spleen, and bends upon itself to the form of the splenic flexure (tracing No. 6). The summit of the flexure is placed immediately below the left extremity of the liver, four inches above the subcostal plane (tracing No. 7). The descending colon proceeds downwards in front of the kidney and through the left lumbar region into the left iliac fossa, where it gives place to the sigmoid flexure. This portion of the colon is only partly contained in the iliac region. A considerable portion of it crosses the mid-Poupart plane, and comes to occupy a place in the hypogastrium and pelvis.

In the first volume of *Quain's Anatomy* (ninth edition) a table is given which details the position of the abdominal viscera with reference to the planes of subdivision. Making allowance for the difference in the level of the two horizontal planes of subdivision, the facts stated in this table agree in the main with the results which I have obtained.

Throughout the greater part of this work I have received the able assistance of Dr. Brooks. He has tested the results on a large number of freshly-opened subjects, and he assures me that in cases where the viscera are healthy he has almost invariably found them in the regions indicated above.

[a] Proc. Anat. Soc. August, 1893. P. 11.

The PRESIDENT said that they were all very grateful for the able and interesting paper which Professor Cunningham had brought forward. Some of the statements were very novel to him, considering the accounts in the text-books. He referred especially to the position of the kidney and other organs. He was always sceptical as to the ease with which organs such as the ovary, &c., could be manipulated. Another peculiar fact was that, according to Dr. Cunningham, the kidney is seldom in the lumbar region, although they were all accustomed to consider it as occupying that position. He would like to hear the opinions of some of the surgeons on this subject.

DR. BALL said that, speaking as a surgeon, he desired to convey his thanks to Dr. Cunningham for the very laborious and able investigation which he has made on the topography of the abdominal viscera. He said that likewise his labours on the topography of the brain have added very much indeed to the ease with which surgeons can localise cerebral disease. He thought that there were greater difficulties in applying accurate mathematical methods of delimitation to the abdominal cavity than to either the cranium or thorax, and pathological changes have a greater scope for producing displacements. He next referred to a case where the upper part of the kidney was found resting on the crest of the ilium, and a space of an inch separated it from the liver. So that in the practice of surgery they must not rely too rigidly on exact limitations. He remembered Professor Cunningham himself told him some time ago, that after all his investigations and all his methods of measurement, he (Dr. Cunningham) would rather trust to his artistic faculties, and to his power of placing his finger directly on a certain convolution of the brain than to any direct measurements. With regard to the abdomen, he thought it was more by the relation of one part to all the surrounding structures that we come to define the position of the viscera, and in that way we can arrive at a definite conclusion rather than by trusting to mathematical lines from fixed points.

DR. MYLES agreed with Dr. Ball that it would be very difficult to apply many of those rules to surgery. With regard to the kidney, he had found that in operations on the dead subject the kidney can always be reached by an incision through the linea semilunaris, and he had experienced no difficulty in getting the liver out of the way. He next referred to a case of injury where the small intestine was ruptured and the vena cava torn across,

Fig. 5.

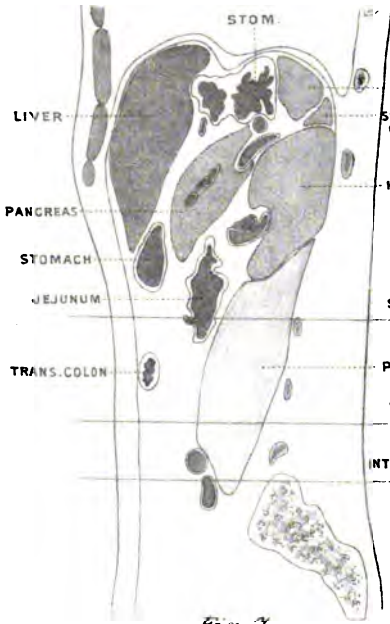


Fig. 6.

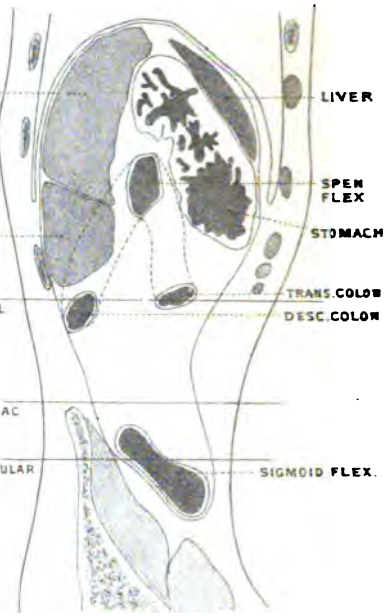


Fig. 7.

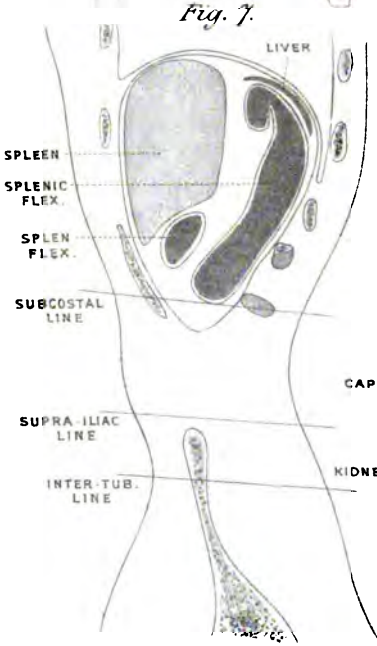
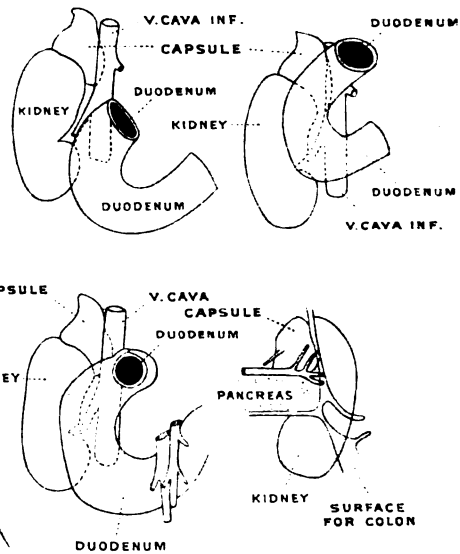


Fig. 8.



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Dr D.J. CUNNINGHAM ON DELIMITATION OF THE REGIONS OF THE ABDOMEN.

Fig. 1.

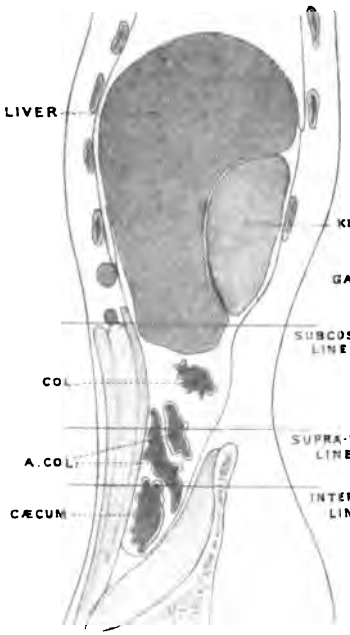


Fig. 2.

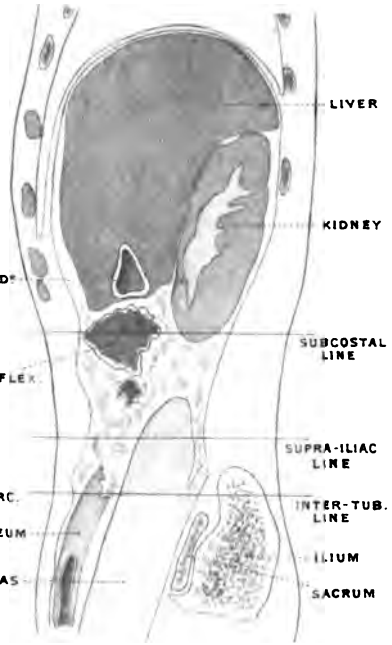


Fig. 3.

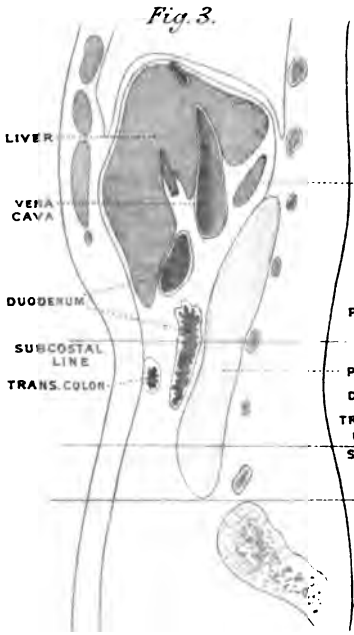
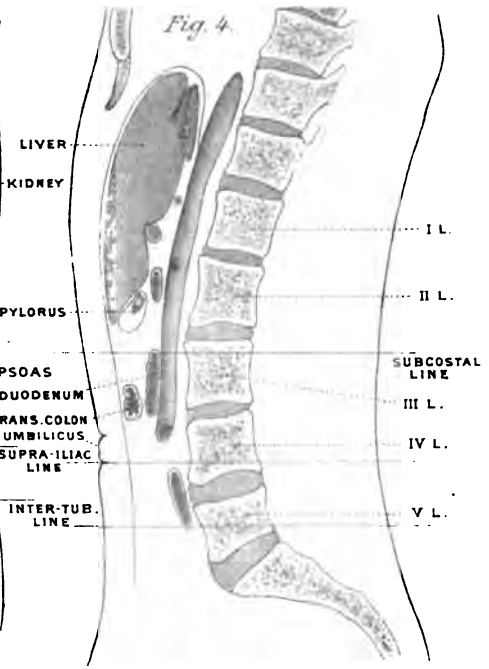


Fig. 4.



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Dr D.J. CUNNINGHAM ON DELIMITATION OF THE REGIONS OF THE ABDOMEN.

but the duodenum escaped. He found it difficult to conceive how the vena cava could be ruptured and the fixed viscus escape. He regretted that Dr. Cunningham had not yet seen his way to publish a book on frozen sections, as it is by means of these that true anatomy is learnt.

Prof. Birmingham was anxious to hear the opinions of the surgeons on the lines proposed by Prof. Cunningham for the delimitation of the abdomen. He always thought that the two old horizontal lines were faulty, inasmuch as they came too close together, and, as Professor Cunningham had shown, the middle zone was occasionally reduced to nothing. His own opinion was that if they were to have two horizontal lines those of Prof. Cunningham were by much the best. With regard to the outer margin of the rectus as a limiting line, he thought it not at all as satisfactory as the mid-Poupart line. The margin of the rectus is very variable, and at the lower part of the abdominal cavity the two recti come so close together that the middle region between them would be reduced to a very small size. Besides, to find the true contents of the various regions frozen sections must be made, and it would be found impossible to carry sections along the margins of the recti. Lastly, he thought with Prof. Cunningham that it would be a great mistake to give up the old division of the abdominal cavity into true pelvis and abdomen proper. There was no region of the cavity so distinctly specialised and so naturally marked off from the rest as the true pelvis.

Prof. Cunningham, in reply, said that he agreed with Dr. Ball that there were no two abdomens absolutely alike in the topography of the contained viscera. He had attempted to bring out the topography of one abdomen only, and that in a subject in which the hollow viscera were empty. He believed the kidney was more movable than it was supposed to be.

EXPLANATION OF PLATES I. AND II.

Plate I.

Tracing 1.—From the left surface of the slab which lay to the right of a plane of section midway between the right lateral surface of the trunk and the right mid-Poupart plane.

Tracing 2.—From the left surface of the slab which lay to the right of the right mid-Poupart plane of section.

Tracing 3.—From the left surface of the slab which lay to the right of a

plane of section midway between the right mid-Poupart plane and the mesial plane.

Tracing 4.—From the left surface of the slab which lay to the right of the mesial plane.

PLATE II.

Tracing 5.—From the left surface of the slab which lay to the right of a plane of section midway between the mesial plane and the left mid-Poupart plane.

Tracing 6.—From the right surface of the slab which lay to the left of the left mid-Poupart plane of the section.

Tracing 7.—From the right surface of the slab which lay to the left of a plane of section midway between the left lateral surface of the trunk and the left mid-Poupart plane.

Fig. 8.—Diagrams to show variations in the relations of the duodenum and right kidney; also the peritoneal relations of the left kidney.—(Brooks).

ABSENCE OF ILEO-CÆCAL VALVE.

By AMBROSE BIRMINGHAM, M.D.;

Professor of Anatomy, Catholic University School, Dublin.

[Read before the Section of Anatomy and Physiology, January 6, 1893.]

THE specimen which I have the honour of exhibiting was removed from an abdomen which was undergoing dissection in the Medical School of the Catholic University. It consists of the termination of the ileum and the first six inches of the large intestine; it has been inflated and dried in the ordinary way, and an opening has been made in the anterior wall of the cæcum—through this it can be seen that the ileo-cæcal valve is entirely absent. The ileo-cæcal opening is almost perfectly round, with sharp, well-defined margins in its present dry condition; there is no trace of a valve. In such a case as this it would be easy to understand how an enema might be forced on through the ileo-cæcal orifice into the small intestine.

LAW OF TRANSVERSE VIBRATIONS OF STRINGS APPLIED TO THE HUMAN LARYNX.

By ROBERT H. WOODS, M.B.;

Throat Surgeon to the Richmond Hospital, Dublin;
Demonstrator of Anatomy in the University of Dublin.

[Read in the Section of Anatomy and Physiology, March 16, 1893.]

It has frequently been attempted to compare the voice to one or other of the orchestral instruments, but no single instrument has been made to work on quite its principle.

In general it may be said that the voice depends for its production on the emission of a number of very rapidly-succeeding puffs of air causing disturbances at their place of origin, which disturbances are transmitted as vibrations, the number of puffs determining the number of vibrations per second, and so the pitch of the note.

Thus far the voice acts in exactly the same way as a reed instrument, but here the analogy ceases. Reed instruments are of two kinds—those in which the reed has no definite rate of vibration of its own, the rate being determined by the length of a resonance apparatus, as, *e.g.*, the bassoon; and those in which the rate of vibration of the reed is its own property, and is independent of a resonance apparatus, as, *e.g.*, a concertina or an American organ.

The voice has with the former variety nothing in common. It differs from the latter in the following particulars:—

(*a*) The disturbances are caused by the free margins of two elastic membranes mutually vibrating the one against the other, instead of by the vibrations of a metallic tongue against a fixed plate.

(*b*) The variations in pitch are produced by modifications in the conditions of the membranes, instead of by a separate apparatus for each note.

(*c*) In the reed the rate of vibration is determined by the mass of the tongue and the strength of the spring, while in the voice it is controlled by the tension on the membranes and some other elements which we shall presently discuss.

The note, then, emitted by the voice depends finally for its pitch on the rate of vibration of the two cords, the ends of which are fixed, and the centre of which is free as far as transverse movement in the vertical or nearly vertical direction—the only one which concerns us—is concerned. Let us then consider in what way this rate is influenced.

Since the chords vibrate as if they were strings, they must vibrate in obedience to the law governing the transverse vibrations of strings.

The law may be written—

$$n=\frac{1}{2l}\sqrt{\frac{t}{m}},$$

where n is the number of vibrations per second, or, in other words, the pitch of the note, l the length of the vibrating string, t the tension, and m the mass per unit of length.

In comparing two pairs of vocal chords of different lengths, the mean pitch of the notes produced by the longer pair is in general lower than that of the shorter pair, because, as seen from the equation, the pitch varies inversely as the length. This is the principal cause of the difference in pitch between a man's voice and that of a woman or child, and is too obvious to need further comment.

When considering a single larynx, l may be regarded as constant. This, of course, is not strictly true, because, when the tension of the chords is raised, their elasticity allows them to yield and become slightly elongated; but, for practical

purposes, the length may be regarded as constant. Eliminating this factor, then, we have—

$$n \propto \sqrt{\frac{t}{m}}.$$

Let us first attend to the influence of the tension. This is one of the most important factors in the variations of the pitch—in fact, so far as I know, the only hitherto accredited factor.

Supposing the mass to be constant then, it follows that the tension required by the vocal chords, in order that they may emit a note an octave above a given one, is not in proportion to its rate of vibration with regard to the fundamental note which is as 2 : 1, but in the square of that ratio, or as 4 : 1. Hence the tension required in the vocal chords in order that they may emit a note two octaves above a given one—that is to say, of four times its rate of vibration—will be sixteen times the tension for the fundamental note; and if the third octave could be completed, the tension would have to be sixty-four times as great. The exertion required to produce these tensions will be approximately in the same ratio. This is the reason why the compass of the voice, no matter what its mean pitch may be, is so very nearly constant, being only exceptionally very much above two octaves, and is also the cause of the suddenness of its limitation.

The rapidity with which the voice gets tired when singing without frequent rests, even moderately high up its register, is at once clear when considered in this light.

The difficulty experienced even by trained singers of singing *piano* near the top of the register has here an explanation. The magnitude of the tension in the chords renders an unusually violent expiratory effort necessary in order to open the glottis, and so loudness is with difficulty avoidable.

This enormous and disproportionate rate of increase of the

required tension must, if it alone modify the pitch, put a limit very shortly on the compass; and it is difficult to conceive how the voice could reach even up to much less beyond the second octave if the alteration in tension were the only modifying factor. We must therefore look for another, and our attention is attracted to *m*—the mass per unit length.

It has long been observed that chords with thick rounded edges accompany deep voices, other things being equal, and thin, sharp-margined chords high ones. This has been explained as follows:—A thick chord means greater development of the thyro-arytænoidei, and consequently less tension of the chords by more perfect opposition to the action of the crico-thyroid, and, as a result of the lower tension, a lower pitch. This explanation leaves entirely out of count the mass of the vibrating chord—a factor which must enter and make itself felt. Now the thyro-arytænoideus internus, by which the shape of the chord is principally affected, is a feeble one in comparison with the externus, and the modifying effect of differences in its development on the total effect of both muscles would, under any circumstances, be negligible, and is certainly not sufficient to explain the difference in pitch between a thick and a thin chord on the assumption of its mere interference with the tension. Hence, I think it is much more rational to put its effect on the pitch down to the score of its mass, rather than its opposition to the crico-thyroid.

But a stronger argument against the theory is found in the fact that the muscle runs immediately external to, and in very close connection with, the vocal chord, and must be looked upon as part and parcel of the vibrating chord itself; and consequently its contraction, instead of lowering the tension of the chord, must raise it. Clinical observation favours this view; for when the muscle is paralysed, the pitch of the voice, instead of rising, becomes lowered, which certainly could not

happen if the muscle were an opponent, pure and simple, of the crico-thyroid.

Again, if force additional to that of the thyro-arytænoideus externus were required to oppose the crico-thyroid, which seems anything but likely, why should the muscle-fibres be laid down in the true vocal chord, whose function, on this assumption, ought not to be contractile, but purely vibratory, and when by their disposition on a higher level their moment round the crico-thyroid joints, and therefore their efficiency, would be greater? These considerations are entirely against the pure opposition of the thyro-arytænoideus internus to the crico-thyroid, and lead us to the belief that the theory was invented as a loose way of explaining as cause and effect two conditions which were known to be associated.

Why, then, does the muscle run in the substance of the chord? The reason is that the vibrating mass of the chord is not a constant quantity, but is determined by the thyro-arytænoideus internus. For when the muscle contracts, it not only raises the tension, but also, by means of its vertical fibres, fixes the base or outer region of the chord, leaving merely the edge free to vibrate; and thus, by the twofold action of increasing the tension and reducing the mass, raises the pitch of the note, and conversely, when quite relaxed, it leaves the outer part of the chord, of which it is a constituent, free to vibrate, and by increasing the mass, as well as diminishing the tension of the chords, lowers the note. This can be observed clinically. The disturbance of the chords during the production of a low note is seen by the laryngoscope to extend much further out than during the production of a high one.

The vertically-running outer fibres of the thyro-arytænoideus internus, for whose existence a plausible apology has been so long wanting, will thus be seen to have a very important function.

The depth of the voice in laryngitis, and occasionally in other diseases—as, for instance, tertiary syphilis—affecting this part, is explained by the formula. The injection and swelling of the chord increases the mass and lowers the note.

No notice has here been taken of the falsetto voice, but it may be mentioned that the shortness of the vibrating chords and the narrowness of the area of disturbance appear to be more concerned in causing its high pitch than the tension.

The President said they were all much indebted to Dr. Woods for his paper, which was a subject which he (the President) considered most interesting and full of subject for thought. He considered Dr. Woods had made most of his points very clear and had brought forward much original and ingenious matter. He, however, wished to question one point—viz., that the crico-arytænoidei laterales tensified the vocal chords and thus raised the pitch of the note. Of course, if this movement of the anterior points of the arytenoids could continue still further in an inward and backward direction after the vocal process had been rotated in, Dr. Woods' contention would hold good.

Dr. Birmingham said it was new to him to hear that the internal part of the thyro-arytenoid might be looked upon as a tensor. He found it hard to agree with the idea of Dr. Woods as to the function of the muscle. When a muscle contracts it increases in thickness, consequently when the internal thyro-arytenoid contracts it makes that portion of the cord in which it lies more bulky. He looked upon the muscle as being of use in modifying the prominence and consistency of the chord, and he thought it was of no great use as a relaxer. According to Dr. Woods, the internal portion of the thyro-arytenoid would contract during the production of a high note while the external portion contracted in producing a low note, so that the two portions of the muscle would be acting in direct opposition to one another, which, at first sight, was contrary to all our ideas.

Dr. Woods, in reply, said that it is only when the chords have a very high tension that the crico-arytænoidei laterales have a double action. It was well known that when a singer tried to sing an unusually high note it was impossible to bring it out with softness,

because when the singer is fairly high up the tendency is to press the arytenoids tighter together and to make it more difficult to open the glottis, and, therefore, a greater exertion is required. With regard to Professor Birmingham's point, he (Dr. Woods) thought that the object of the internal portion of the thyro-arytenoid contracting was not to approximate the points of origin and insertion but for the purpose of increasing its own tension. Simultaneously with this contraction they had the contraction of the crico-thyroid, which must prevent shortening and thickening of the thyro-arytænoideus internus. Therefore they must come to the conclusion that the different fibres of the internal portion of the muscle must have opposing functions just as those of the gluteus medius have.

THE NATURE OF THE WORK OF THE KIDNEY AS SHOWN BY THE INFLUENCE OF ATROPINE AND MORPHINE UPON THE SECRETION OF URINE.

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[Read in the Section of Anatomy and Physiology, March 16, 1893.]

It was shown during the past year by Dr. Grijns,[a] who worked in Professor Ludwig's laboratory, that the temperature of the urine in the pelvis of the kidney, immediately after secretion, is often higher than that of the blood in the aorta.

There is thus a redistribution of the potential energy carried by the blood-stream to the kidney, together with the production of heat, such as one is accustomed to associate with the functional activity of "secreting" glands like the pancreas or salivary glands.

Now it is well known that atropine has an inhibitory effect upon the secretory activity of these glands. It became, therefore, of interest to determine how far the kidney would correspond in this respect, if at all, to the glands mentioned. Accordingly, with the advice and permission of Professor C. Ludwig, to whom my best thanks are due, I undertook an investigation into this subject, the results of which are given in the following pages.

[a] Grijns.—"*Die Temperatur des in die Niere einströmenden Blutes und des aus ihr abfliessenden Harnes.*" His u. Du Bois Reymond's Archiv. f. Physiologie, 1893.

I.—METHOD OF CARRYING OUT THE EXPERIMENTS.

For this purpose large healthy young dogs were chosen. The urine was collected by placing suitable cannulæ in the ureters. This was done at a considerable distance from the kidneys, in order to avoid mechanical or other interference with these organs, for, as is well known, this would of itself diminish or arrest the secretion of urine for a time.

The ureters were reached from the front by making a small incision in the abdominal wall, over the outer part of the rectus muscle, at a point somewhat below the crest of the ileum. The sheath of this muscle was then incised to a corresponding extent, the rectus hooked inwards, and the posterior layer of the sheath divided. The abdominal cavity was in this manner sufficiently opened to allow one finger to be inserted, when the ureter could readily be felt where it crosses the common iliac artery. It was then brought to the surface, and the cannula securely tied in. This being done, the organ was immediately returned into the abdominal cavity, and the wound closed around the stalk of the cannula.

When the observation commenced, the urine was led from the cannulæ into ordinary glass measure cylinders of 30cc. capacity. Into these it could be seen dropping periodically, two or three drops at a time, corresponding to the rythmic contractions of the ureters.

In the first experiment I attempted to collect the urine from the bladder by a catheter and syphon arrangement, but at once discarded this method as not being sufficiently accurate.

The urine was collected in the way described for an hour, the drug was then administered by intravenous injection, and the urine collected for a second hour. At the end of this second hour the glasses were once more changed and

the urine again collected for a third hour. In many of the experiments a fourth, or even a fifth collection was made.

The amount was at once recorded in each case, and the urine preserved for the analysis which in most instances was commenced on the day of the experiment. In order to prevent decomposition, however, the urine was immediately brought into small tightly-corked flasks, thymol having previously been added, and the whole preserved in an ice chest. When the experiment was completed, the animals were killed by means of an anæsthetic, and the kidneys removed for examination.

II.—METHODS EMPLOYED FOR MAKING THE ANALYSES OF THE URINE.

The analyses made were, first, an estimation of the total nitrogen, and second, an estimation of the amount of urea in each specimen of urine taken.

The total nitrogen was estimated by the method of Kjeldahl.

For estimating the urea, the method chosen was that introduced by Mörner and Sjökvist.[a]

This is a method which I venture to speak very highly of. Indeed, none of the methods ordinarily employed in this country can, I think, compare with it for accuracy. The only drawback it has is the cost of carrying out the analysis in this country, owing to the large quantities of alcohol and ether consumed.

The other methods at one's disposal are, I believe, much too inaccurate for scientific purposes. Liebig's gives in reality only an approximate estimation of the total nitrogen. This is seen when its results are compared with those of the Kjeldahl method. The hypobromite method is little if at all

[a] Skandinav. Archiv. f. Physiologie, Bd. 2, 1890; also Bödtker. Zeitschr. Physiolog. Chemie., Bd. 17, 1892.

better, for not only is the nitrogen of urea liberated, but also, to a great extent, that of kreatinin, uric acid, and the ammonia compounds of the urine. Even oxygen is set free under some circumstances.

The Mörner and Sjökvist method has not hitherto, so far as I am aware, been employed in this country; a short description of it may not, therefore, be out of place.

The principle upon which it depends lies in the fact, that while urea is readily soluble in a mixture of alcohol and ether, the other nitrogen-holding substances, especially their compounds with barium, are very insoluble. The only exceptions to this statement are the ammonia salts, but these are got rid of during the process, as will be seen.

In carrying out the method, 5 cc. of urine are measured into a small flask of about 200 cc. capacity. To this are added 5 cc. of a mixture which contains 350 grms. of $BaCl_2$, and 50 grms. of $Ba(OH)_2$ in a litre of water. The two are mixed, and then 150 cc. of the alcohol and ether mixture are added. This consists of two parts of ordinary alcohol (96 per cent.) to one part of ether. The flask is now tightly corked, the contents shaken up, and the whole allowed to stand for 24 hours. The solution, which contains urea and ammonia, is then filtered off, the precipitate carefully washed with about 100 cc. of the alcohol and ether mixture, and the filtrate evaporated down to 10 or 15 cc. in a porcelain capsule on a water bath. The temperature of the bath must not exceed 60° C.

During the evaporation, the ammonia, previously set free by the baryta mixture, is driven off. Should the urine have been highly acid, it is desirable to add a little magnesia during the evaporation. The contents of the porcelain capsule are now carefully washed into a Kjeldahl flask, and the nitrogen estimated in this manner.

In some of my experiments the urine was slightly tinged

with blood, and consequently contained albumin. It was, therefore, necessary to get rid of this before estimating for the total nitrogen of the urine itself. In order to do this the urine was boiled in a small tightly-stoppered bottle, which was opened after it had cooled, and the pure urine filtered off. Before boiling, a drop of glacial acetic acid was added. When the quantity of urine was sufficient the amount of albumin was determined, and in all cases was found to be very small. The method of determining it was to estimate the total nitrogen before and after precipitation of the albumin: the difference naturally gave the nitrogen of the albumin.

III.—ADMINISTRATION OF THE DRUGS.

These were directly injected into the circulation by means of a cannula inserted into the right jugular vein. In the first four experiments a solution of urea, in normal saline fluid, was also introduced into the venous system. This was judged to be necessary, under the impression that sufficient urine to make the required estimations would not otherwise be obtainable in the time. The solution was injected in two equal quantities at the beginning of the first and second hours. Later experiments, however, showed that this procedure was unnecessary, and was moreover liable to introduce a source of error; consequently it was abandoned.

Now, it is known that atropine may be impure from the presence of hyoscyamine or duboisine. It was, therefore, necessary to ascertain that the drug was pure. This can readily be done by means of the polarimeter; for whereas atropin does not affect the plane of polarised light, the other two drugs bring about a rotation. I accordingly examined my solution of atropin, with the result that no deviation could be detected in a tube 40 cm. in length filled with the solution I employed—viz., 0·8 per cent. This was verified

by my friend Dr. Max Siegfried, to whom I am also indebted for other valuable advice and assistance in the course of the investigation.

The amount of atropine administered varied from 1½–2 mgrms. per kilo of body weight of the animal used. The quantity of morphine given varied from 3 to 5 mgrms. per kilo of the body weight.

These doses though large were not by any means fatal. This is shown by the fact that the kidneys had recovered to a very great extent from their influence in the second hour after administration. Indeed, in many cases the amount of urine secreted during this hour exceeded that during the hour prior to giving the drug.

IV.—RESULTS OF THE EXPERIMENTS.

The number of experiments carried out so far amounts to eleven in all. These are arranged in three classes—those in which atropine alone was given, those in which atropine with morphine was administered, and, lastly, those in which morphine alone was injected. Six experiments, numbers II. to VII. inclusive, fall into the first group, three, numbers I., VIII., and IX., into the second, and two only, X. and XI., into the third.

In the following tables I have grouped the experiments in accordance with this arrangement.

1. *Effect on the amount of urine secreted.*

TABLE I.—*Showing the quantity of Urine secreted per hour.*

Except in a few cases, where the quantity of urine was insufficient, two estimates were always made for each sample of urine. The results yielded closely corresponded in every instance. The numbers in the following tables are in each case the averages of these two estimates:—

Experiment	1st hour	2nd hour	3rd hour
	Atropine alone given.		
II.	34 cc.	16 cc.	1 cc.
III.	23½ „	18 „	20½ „
IV.	46½ „	64 „	60 „
V.[a]	34¼ „	30½ „	37½ „
VI.	48¾ „	35½ „	54½ „
VII.	43¾ „	35¾ „	40¼ „
	Atropine with Morphine given.		
I.	56 cc.	39 cc.	44 cc.
VIII.[b]	17 „	9 „	20¾ „
IX.	16 „	9½ „	22¾ „
	Morphine alone given.		
X.	16¾ cc.	11½ cc.	15¼ cc.
XI.	18 „	15 „	26 „

When we examine this table we see that a diminution has occurred in the quantity of urine secreted during the second hour, in every case except experiment IV. In the third hour the quantity has, as a rule, again increased, approximating, and in some of the experiments exceeding, the normal of the first hour. In one experiment, however, the quantity is almost nil during the third hour—viz., in experiment II. In this instance the dog died a few moments before the end of this hour, the secretion of urine having been almost completely suppressed for more than an hour.

The dose of atropin administered was tolerably large, but I do not attribute the dog's death to this cause. The animal's temperature rose to a great height, and I have no doubt hyperpyrexia was the cause of death. This was one of the experiments in which a saline solution of urea was injected into the circulation. It is to this I attribute the rise in temperature; at all events, it occurred only in those cases in which the saline solution of urea was injected.

[a] The urine was collected in this experiment for periods of 1½ hours in each case.

[b] Urine collected for periods of 2 hours in this experiment.

The introduction of the solution of urea also accounts for the exception in experiment IV. In this case a large quantity of fluid (500 cc.) was twice injected—viz., at the beginning of the first and second hours—much more than was got rid of by the kidneys in the hour. The experiment forms an exception all through, no doubt owing to this fact. It is not without interest, however, since it shows that by introducing a large quantity of fluid into the circulation the effects of atropine may be overcome.

In the morphine experiments the diminution during the second hour, and subsequent return during the third, were even more marked than in those where atropine alone was used. Moreover, in most of the cases morphine produced a temporary arrest of the secretion immediately after its administration, lasting from fifteen minutes to two hours.

2. *Effect on the amount of Urea excreted.*

(*a.*) TABLE II.—*Showing the quantity of Urea excreted per hour.*

Experiment	1st hour	2nd hour	3rd hour
	Atropine alone given.		
II.	3·16 grms.	1·51 grms.	—
III.	2·86 „	1·64 „	2·08 grms.
IV.	4·88 „	5·96 „	5·87 „
V.[a]	3·71 „	3·18 „	5·80 „
VI.	1·50 „	1·05 „	1·44 „
VII.	3·86 „	3·34 „	3·47 „
	Atropine with Morphine given.		
I.	1·43 grms.	0·69 grms.	1·52 grms.
VIII.[b]	1·82 „	0·51 „	1·57 „
IX.	1·23 „	—	1·63 „
	Morphine alone given.		
X.	1·59 grms.	0·86 grms.	1·27 grms.
XI.	1·73 „	0·72 „	1·55 „

[a] The quantities in this experiment are those excreted in 1½ hours in each case.

[b] The quantities here are those excreted in 2 hours in each case.

In this table we see that the quantity of urea also is diminished during the second hour, with a subsequent return in the third hour. The diminution is even more marked than in the case of the urine. This is accounted for by the fact that not only is the quantity of urine diminished during the second hour, but the percentage quantity of urea which it contains is also lowered. This will be seen on examining the next table. The exception seen in experiment IV. has been already explained.

(*b.*) Table III.—*Showing the per-centage quantity of Urea contained in the Urine secreted.*

Atropine alone given.

Experiment	1st hour	2nd hour	3rd hour
II.	9·28 per cent.	9·46 per cent.	—
III.	12·16 „	9·11 „	10·21 per cent.
VI.	10·0 „	9·32 „	9·70 „
V.	10·84 „	10·42 „	10·13 „
VI.	3·09 „	2·95 „	2·62 „
VII.	8·83 „	9·34 „	8·52 „

Atropine with Morphine given.

I.	2·56 per cent.	1·77 per cent.	3·44 per cent.
VIII.	10·70 „	5·63 „	7·73 „
IX.	8·58 „	— „	6·80 „

Morphine alone given.

X.	9·49 per cent.	7·46 per cent.	8·33 per cent.
XI.	9·64 „	4·82 „	5·94 „

On examining the above table we see that the per-centage of urea contained in the urine is diminished during the second hour. There is also in this particular a return during the third hour towards the normal condition of the first. As will be seen, there is a greater diminution in the experiments where morphine was employed. The only exception in the table is experiment VII.

3. *Effect on the total nitrogen excreted in the Urine.*

(*a.*) TABLE IV.—*Showing the total nitrogen excreted per hour.*

Atropine alone given.

Experiment	1st hour	2nd hour	3rd hour
II.	1·58 grms.	0·80 grms.	—
III.	1·46 „	0·92 „	1·13 grms.
IV.	2·57 „	3·08 „	2·89 „
V.[a]	1·93 „	1·65 „	2·01 „
VI.	0·78 „	0·55 „	0·83 „
VII.	1·93 „	1·71 „	1·81 „
	Atropine with Morphine given.		
I.	0·77 grms.	0·39 grms.	0·84 grms.
VIII.	1·01 „	0·32 „	0·84 „
IX.[b]	0·71 „	0·37 „	0·85 „
	Morphine alone given.		
X.	0·84 grms.	0·53 grms.	0·70 grms.
XI.	0 97 „	0·49 „	0·92 „

(*b.*) TABLE V.—*Showing the percentage of total nitrogen excreted in the Urine.*

Atropine alone given.

Experiment	1st hour	2nd hour	3rd hour
II.	4·33 per cent.	4·42 per cent.	—
III.	6·20 „	5·10 „	5·50 per cent.
IV.	5·52 „	4·81 „	4·78 „
V.	5·69 „	5·41 „	5·36 „
VI.	1·64 „	1·55 „	1·48 „
	Atropine with Morphine given.		
I.	1·38 per cent.	1·01 per cent.	1·90 per cent.
VIII.	5·95 „	3·61 „	4·16 „
IX.	4·44 „	3·91 „	3·73 „
	Morphine alone given.		
X.	4·43 per cent.	3·48 per cent.	3·89 per cent.
XI.	4·49 „	2·25 „	2·77 „

In the above tables we see that the influence of the drugs upon the total nitrogen is similar to that upon the

[a] The observations were made for periods of 1½ hours in this experiment.
[b] The observations were made for peri ds of 2 hours in this experiment.

urea. It differs in one particular, however. The diminution of total nitrogen is not so marked as is the diminution of urea. This will be more clearly shown in later tables, and its probable bearing will then be commented upon.

In Table V. there are two exceptions—viz., experiments II. and VII. In both of these we find an increase in percentage of urea, and also of total nitrogen. It is possible, however, that a slight exaggeration of the increase has appeared in experiment II., since there was very little urine at my disposal to make the analysis for total nitrogen. Seeing, however, that both the urea and total nitrogen correspond in the two experiments—that is to say, both are increased—I think we must regard them as genuine exceptions. Experiment VII. certainly is: the figures are in each case the mean of two very closely corresponding estimations.

4. *Effect on the nitrogen other than that in Urea.*

In the following tables I propose to call this nitrogen unknown nitrogen.

(*a*.) Table VI.—*Showing the quantity of "unknown" nitrogen excreted per hour.*

Atropine alone given.

Experiment	1st hour	2nd hour	3rd hour
II.	0·11 grm.	0·10 grm.	—
III.	0·12 „	0·15 „	0·15 grm.
IV.	0·29 „	0·30 „	0·16 „
V.[a]	0·20 „	0·17 „	0·27 „
VI.	0·08 „	0·06 „	0·16 „
VII.	0·12 „	0·15 „	0·19 „
Atropine with Morphine given.			
I.	0·09 grm.	0·07 grm.	0·13 grm.
VIII.[b]	0·17 „	0·09 „	0·11 „
IX.	0·06 „	—	0·09 „

[a] Quantities here given are for 1½ hours.
[b] Quantities here given are for 2 hours

Morphine alone given.

Experiment	1st hour	2nd hour	3rd hour
X.	0·10 grm.	0·13 grm.	0·11 grm.
XI.	0·16 „	0·15 „	0·20 „

(*b.*) TABLE VII.—*Showing the percentage of "unknown" nitrogen in the Urine excreted.*

Atropine alone given.

Experiment	1st hour	2nd hour	3rd hour
II.	0·32 per cent.	0·60 per cent.	0·74 per cent.
III.	0·52 „	0·85 „	0·74 „
IV.	0·62 „	0·47 „	0·75 „
V.	0·65 „	0·55 „	0 63 „
VI.	0·15 „	0·17 „	0·25 „
VII.	0·29 „	0·42 „	0·47 „

Atropine with Morphine given.

I.	0·19 per cent.	0·18 per cent.	0·29 per cent.
VIII.	0·96 „	0·98 „	0·55 „
IX.	0·38 „	—	0·40 „

Morphine alone given.

X.	0 59 per cent.	1·09 per cent.	0·68 per cent.
XI.	0·90 „	1·01 „	0·70 „

In this instance I purpose first to examine Table VII. which shows the influence of the drugs upon the percentage of "unknown" nitrogen contained in the urine secreted. The reason of doing this is because the percentage table illustrates more clearly the main result obtained—viz., *that during the second hour the unknown nitrogen is relatively increased, this increase again suffering a diminution in the third hour.*

There are three exceptions; one of these is our old exception, experiment IV., the others are experiments I. and V. In experiment I. we find an increase, however, occurring in the third hour, instead of the usual return towards the normal. It would appear, therefore, that the increase was delayed in this instance till the third hour.

There is no adequate explanation for the exception in experiment V.

When we now examine table VI. we find it corresponds with table VII., in so far that many of the experiments, while showing a diminution in the quantities of urine, of urea, and of total nitrogen, during the second hour, still show that *the absolute amount of unknown nitrogen is actually increased.*

In those cases where an increase has not occurred in the second hour, we find it taking place in the third.

The tables also show, what I take to be of very considerable interest, that in those experiments where morphine was used either alone or in conjunction with atropine, this relative increase in the unknown nitrogen is much more marked.

(c.) Table VIII.—*Showing the proportion which the "unknown" nitrogen bears to the total nitrogen.*

Experiment	1st hour	2nd hour	3rd hour
	Atropine alone given.		
II.	7·0	11·9	—
III.	8·5	16·7	13·3
IV.	11·2	9·7	5·3
V.	11·4	10·0	11·8
VI.	9·6	11·2	17·4
VII.	6·5	6·8	10·5
	Atropine with Morphine given.		
I.	13·6	18·0	15·6
VIII.	16·6	27 3	13·2
IX.	8·6	—	10·7
	Morphine alone given.		
X.	11·9	23·8	15·3
XI.	16·6	30·9	22·2

This table illustrates, in a more striking manner, the facts already shown by the two preceding tables—viz., the relative increase in unknown nitrogen during the second

hour, with (in the great majority of the experiments), a return towards the primitive condition in the third hour.

5. *Influence of the drugs upon blood-pressure.*

It now became a question to determine whether the drugs produced their inhibitory effects upon the secretion of urine by lowering blood-pressure or not.

I, therefore, made some experiments to examine their effects upon blood pressure. In the first (experiment IX.*b*) atropine was administered to a dog in proportionate dose to that employed when the urine was collected. After half an hour had elapsed, when, as I had seen in the previous experiments, the effects of the drug were at its height, I gave a corresponding dose of morphine.

The results were, that atropine produced a slight, but very transitory, fall of pressure, followed on the other hand by a continued moderate rise. The fall endured for less than one minute.

Morphine, on the contrary, immediately brought about a marked fall. This fall to a certain extent accounts for the preliminary arrest and subsequent diminution in the secretion of urine under the influence of the drug in question. It does not, however, wholly account for it. This will be seen when we examine experiments X. and XI., where a blood-pressure tracing was taken side by side with the collection of urine.

In experiment X. the mean pressure during the hour before morphine was given, stood at 128 mm., Hg., the quantity of urine being 16¾ cc. Immediately after the administration of the drug the pressure sank to 47·5 mm., but steadily recovered till in a quarter of an hour it had reached 94·5 mm., at which point the secretion of urine recommenced. During the hour, beginning with the re-establishment of the secretion, the mean pressure was 97·8 mm., and the quantity of urine secreted 11½ cc. In

the following hour the quantity secreted reached 15¼ cc., but the mean pressure only registered 105 mm. Thus in this third hour the quantity of urine was almost as great as that in the first hour, whereas the mean blood-pressure was considerably lower, than that of the same hour.

The results of experiment XI. are, in this respect, still more remarkable, because here the blood-pressure had returned to a point which under ordinary circumstances ought to have caused a secretion a considerable length of time before this was re-established. Moreover, during the third hour, when the quantity of urine much exceeded that of the first hour, the mean blood-pressure was lower by some millimetres than that even of the second hour, and consequently lower than that of the first.

The actual figures are as follows:—

Mean blood-pressure of first hour	-	117·9	mm., Hg.;
Quantity of urine „	-	18	cc.;
Mean blood-pressure of second hour	-	117·5	mm., Hg.;
Quantity of urine „	-	15	cc.;
Mean blood-pressure of third hour	-	115·5	mm., Hg.;
Quantity of urine „	-	26	cc.

It is to be regretted that, up to the present, the number of experiments in which blood-pressure was recorded is so small. But even as the case stands there can, I think, be no hesitation in accepting the statement that diminution of blood-pressure does not by any means wholly account for the lessened secretion of urine, brought about by the administration of morphin.

The numbers in experiment IX.*b*, previously alluded to, are as follows:—

Blood-pressure before giving atropine	-	127	mm., Hg.
„ 13 secs. after „	-	107	„
„ 44 „ „	-	124·5	„
„ 10 mins. later -	-	136·5	„
„ 10 „ -	-	143	„
„ 10 „ -	-	144	„

Morphin was now administered, which brought the pressure down to 45·5 mm., Hg., followed by a steady and fairly rapid recovery till within the hour it stood again at 96·5 mm., Hg.

6. *Influence of the drugs upon temperature.*

In the earlier experiments no systematic record of temperature was taken; it was, however, observed in those in which the saline solution of urea was introduced that the animals exhibited signs of increased temperature, such as "panting," &c., with which one is familiar in dogs. In experiment II., on noticing these signs to a very marked degree during the second hour, the temperature was taken and was found to be 42·3° C. It probably rose still higher, and indeed there is little doubt on my mind that this dog died from hyperpyrexia.

In the later atropine experiments the usual effect was a slight fall during the course of the experiment, with one or two exceptions, in which a moderate rise occurred after administration of the drug, which gave place to a slight fall still later.

In the experiments where morphine, either alone or in conjunction with atropine, was given, the temperature fell to a small extent during the course of the experiment. Part of this fall is probably due to the length of time the dogs were kept on the table with the abdomen upwards, thus allowing a greater escape of heat. The figures are given in the separate record of experiments at the end.

7. *Summary of results with deductions.*

The main points established by the research so far as it has gone are—

(*a.*) *With regard to atropin*, that it—

(1) Diminishes the quantity of urine.

(2) Diminishes the total quantity and percentage quantity of urea.

(3) *Increases relatively, and in many cases absolutely, the amount of nitrogen other than that contained in urea.*

(4) Its effects cannot be attributed to the influence which it exerts upon blood-pressure.

(*b.*) *With regard to morphin*, the results are that it also—

(1) Diminishes the quantity of urine, causing even a temporary arrest of the secretion.

(2) Diminishes the total and percentage quantities of urea, even more markedly than does atropin.

(3) *Increases the excretion of the "unknown" nitrogen.*

(4) While diminishing the blood-pressure, its effect upon the secretion of urine cannot be wholly attributed to this cause.

In conclusion, I may say that in so far as these experiments bear upon the nature of the work of the kidney, they tend to show that the production of urine is to a certain extent by a process analogous to the manufacture of the secretion by other glands which are influenced by atropine. Moreover, the increase of the unknown nitrogenous compounds, side by side with the decrease in the excretion of urea, may, I think, fairly be taken the one as the counterpart of the other, and if so this fact, coupled with the production of heat during the activity of the gland, would lead us to *infer that part of the urea is possibly manufactured in the kidney out of one or other of what I have called the unknown nitrogenous compounds.*

Synopsis of the Individual Experiments.

The numbers in the following *résumé* represent the percentage quantities of the different constituents of the urine. Urea is represented by the nitrogen which it contains, the substance itself being given in Tables II. and III.

EXPERIMENT I.—Dog, 24 kilos. 200 cc. of a solution containing 0·1 per cent. urea, and 9 per cent. grape sugar injected at beginning of first and second hours. 0·048 grm. atropin with morphin given.

	Urine cubic centimetres	Total N. of urine per cent.	Nitrogen of urea per cent.	Unknown nitrogen per cent.	Nitrogen of albumen	Temp.	Remarks
1st hour	56	1·38	1·19	0·19	—	—	Urine collected by catheter
2nd ,,	39	1·01	0·83	0·18	—	—	
3rd ,,	44	1·96	1·61	0·29	—	—	

EXPERIMENT II.—Dog, 42 kilos. 200 cc. urea solution (0·125 per cent.) twice injected. 0·064 grm. atropin given.

1st hour	34	4·65	4·33	0·32	—	—	—
2nd ,,	16	5·02	4·42	0·60	—	42·3°	—
3rd ,,	1	—	—	—	—	—	—

EXPERIMENT III.—Dog, 29 kilos. 500 cc. urea solution (0·083 per cent.) twice injected. 0·04 grm. atropin given.

1st hour	23·5	6·20	5·68	0·52	—	—	—
2nd ,,	18·0	5·10	4·25	0·85	—	—	—
3rd ,,	20·0	5·50	4·76	0·74	—	—	—

EXPERIMENT IV.—Dog, 42 kilos. 500 cc. solution of urea (0·05 per cent.) twice injected. 0·048 grm. atropin given.

1st hour	46·5	5·52	4·90	0·62	—	—	—
2nd ,,	64·0	4·82	4·35	0·47	—	—	—
3rd ,,	60·5	4·78	4·53	0·25	—	—	—
4th ,,	58·0	4·44	3·92	0·52	—	—	—
5th ,,	55·75	4·46	4·01	0·35	—	—	—

EXPERIMENT V.—Dog, 29½ kilos. 0·036 grm. atropin given. No urea solution introduced. N.B.—*The observations in this experiment were made for an hour and a half in each case.*

1st period	34¼	5·69	5·04	0·65	—	—	—
2nd ,,	30½	5·41	4·86	0·55	—	—	—
3rd ,,	37·5	5·36	4·73	0·63	—	—	—

EXPERIMENT VI.—Dog, 23 kilos. 0·044 grm. atropin given. No urea solution administered.

1st hr.	R. K. 29¾	1·67	1·54	0·13	0·00	39·5° C.	—
	L. K. 19	1·52	1·34	0·18	0·03		
2nd ,,	35½	1·55	1·37	0·17	0·06	40·0° C.	—
3rd ,,	54½	1·48	1·22	0·25	0·03	40·5° C.	—

EXPERIMENT VII.—Dog, 23¼ kilos. 0·56 grm. atropin given. No urea solution administered.

1st hr.	R. K. 22½	4·25	4·01	0·24	0·09	38·8° C.	—
	L. K. 21½	4·57	4·23	0·34	—		
2nd ,,	35¾	4·78	4·36	0·42	Trace	38·8° C.	—
3rd ,,	40¾	4·44	3·98	0.46	,,	38·2° C.	—
4th ,,	36½	4·50	4·10	0·40	,,	38·4° C.	—

Experiment VIII.—Dog, 18½ kilos. 0·042 grm. atropin, with 0·14 grm. morphin given. N.B.—The observations in each case extended over periods of two hours. No urea solution injected.

	Urine cubic centimetres	Total N. of urine per cent.	Nitrogen of urea per cent.	Unknown nitrogen per cent.	Nitrogen of albumen.	Temp.	Remarks
1st period	17	5·95	4·99	0·96	—	38·6° C.	The urine
2nd ,,	9	3·61	2·63	0·98	—	38·3° C.	was sup-
3rd ,,	20¾	4·16	3·61	0·55	—	38·0° C.	pressed for ¾ hr.

Experiment IX.—Dog, 17½ kilos. 0·027 grms. atropin with 0·09 grm. morphin administered. No urea solution injected.

1st hr.	R. K. 8	4·51	4·11	0·41	None	39·0° C.	Urine sup-
	L. K. 8	4·37	4·06	0·31	,,		pressed
2nd ,,	R. K. 4¾	4·15	Not enough urine to estimate urea		,,	39·0° C.	for ½ hr.
	L. K. 4¾	3·66					
3rd ,,	R. K. 12½	3·95	3·48	0·47	,,	39·4° C.	—
	L. K. 10½	3·51	3·17	0·34			
4th ,,	19	4·22	3·78	0·44	,,	38·4° C.	—

Experiment X.—Dog, 23½ kilos. 0·12 grm. morphin administered. No urea solution. Blood-pressure taken.

1st hour	16¾	5·02	4·43	0·59	—	39·8° C.	Urine sup-
2nd ,,	11½	4·57	3·48	1·09	—	40·2° C.	pressed
3rd ,,	15½	4·59	3·88	0·69	—	39·5° C.	for 15
4th ,,	14½	4·84	4·15	0·69	—	38·8° C.	mins.

Experiment XI.—Dog, 30 kilos. 0·12 grm. morphin injected. Blood-pressure taken. No urea solution introduced.

1st hour	18	5·39	4·49	0·90	—	40·2° C.	Secretion
2nd ,,	15	3·26	2·25	1·01	—	39·8° C.	arrested
3rd ,,	26	3·57	2·77	0·70	—	39·6° C. 39·0° C.	for 2 hrs. 2 mins.

COLLECTIVE INVESTIGATION IN THE ANATOMICAL DEPARTMENT OF THE CATHOLIC UNIVERSITY MEDICAL SCHOOL.

EDITED BY P J FAGAN, L.R.C.P. & R.C.S.

The Arrangement of the Branches of the Right Bronchus and their Relations to the Pulmonary Artery. By P. J. FAGAN, L.R.C.P. & R.C.S., Demonstrator of Anatomy, Catholic University Medical School.

IN investigating this subject I adopted the following method:—Having removed the right lung from the body I injected the pulmonary artery with plaster, and then dissected out its chief branches as well as the larger subdivisions of the bronchus. I treated seven lungs in this way with the following result:—

The right bronchus, after a course of about half an inch, gives off from its outer aspect a large horizontal branch, the sole supply of the upper lobe. Nearly three-quarters of an inch lower down there arises, from its anterior aspect, a smaller branch for the middle lobe, and just beneath this a horizontal branch springs from the posterior aspect, which immediately distributes ascending, horizontal, and descending branches to the postero-lateral aspect of the upper region of the lower lobe. The next branch arises from the inner surface and splits into two for the postero-internal part of the lower lobe. Beneath and very close to this branch a large one is given off, from the anterior aspect, for the antero-lateral tract of the lower lobe. Then close together an anterior and a posterior branch. After this the branches are much reduced in size—one small one being given off from the anterior and two from the posterior

aspect. Conjointly with the termination of the parent stem these branches ærate the remainder of the lower lobe.

The pulmonary artery lies in front of the main bronchus, below the level of the upper lobar, and just overlapping the origin of the middle lobar branch. It bifurcates, the upper division giving three branches to the upper lobe,

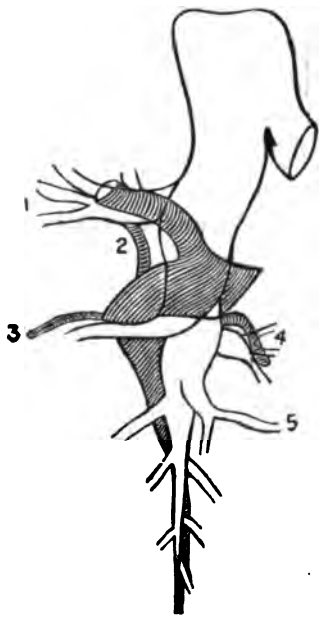


Diagram of Right Bronchus and Pulmonary Artery, from antero-internal aspect. Bronchus plain, artery shaded.

1. Branches for upper lobe. 2. Branch from inferior division of artery to upper lobe. 3. Branches for middle lobe. 4. Horizontal branches. 5. Internal branch of bronchus.

which run on the inner side and in front of the corresponding branches of the upper lobar bronchus. The lower division, larger than the upper, winds outwards and slightly downwards until it gains a position between the upper and middle lobar bronchi. Here it distributes two branches—one upwards to the upper lobe, which runs behind the

upper lobar bronchus and is distributed behind and below it; and one to the middle lobe, which runs above and to the outer side of the middle lobar bronchus, its subdivisions preserving the same relation. Then the artery turns downwards and backwards and runs on the postero-external aspect of the bronchus, gradually assuming the posterior position which it attains lower down. The branch corresponding to the posterior horizontal bronchus mentioned above (first dorsal hyparterial—Aeby), arises near the bend of the artery. It is situated above and in front in six, above and behind in one case. The arteries corresponding to the bronchi, named by Aeby second ventral and cardiac, are situated anteriorly and somewhat external to their bronchi, in six cases posteriorly, and inferiorly in one case. Aeby's third ventral bronchus has its corresponding artery on its superior and anterior surface. The branch corresponding to the termination of the bronchus is behind.

The disposition of the Spongy Bones and Meatuses of the Nose, with Especial Reference to a Fourth Meatus. By KIERAN DELANY.

THERE were 30 nasal fossæ examined in reference to the above, and only in 2 cases have *distinct* evidences been found of a fourth or highest meatus.

Both of these were formed by the projection of a thin lamina of bone from the side of the ethmoid, dividing the ethmo-sphenoidal recess into two parts. This plate ran backwards and a little downwards, and in one of the specimens was slightly curved on itself.

One of the meatuses thus formed opened by means of a small foramen directed backwards into the sphenoidal cells, while in the other no such opening could be found.

However, there were some *traces* of a fourth meatus in 16 cases, formed either by a portion of bone partially

dividing the ethmo-sphenoidal recess, or else standing out directly below it and being in all cases attached to the side of the ethmoid. In 4 of these cases there was an opening into the posterior ethmoidal cells, and in 2 others a foramen leading into the sphenoidal cells.

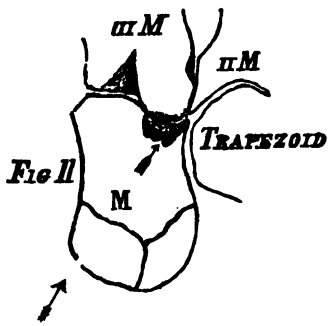
In one nasal fossa there was no superior turbinated bone, and, therefore, no third meatus.

The Condition of the Os Styloideum as attached to—(a) the Third Metacarpal; (b) the Magnum; (c) the Trapezoid; (d) or free. By JOSEPH P. FRENGLEY.

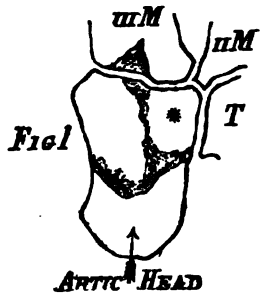
THE situation of this bone has been examined in 41 cases, and without exception the os styloideum was found to be attached to the third metacarpal. In 2 of the cases, however, included in the above number, in addition to the presence of a rudimentary styloid process on the third metacarpal, there was also on the dorsum of the magnum a distinctly marked projection, in the first case rounded and very prominent, and in the second rough and uneven, but also prominent. This projection articulated with the proximal end of the little-developed styloid process.

In the articulation of the attached os styloideum or styloid process with surrounding bones the two main groups could be distinguished. The FIRST group again may be sub-divided—*firstly* into a variety in which the os styloideum was rounded and prominent on the posterior surface, and overlapped the inner and posterior margin of the base of the second metacarpal (Fig. II.) and also the base of the magnum, which, in this situation, presented a depression or smoothing off of its posterior surface. The styloid process here articulated near its base with the second metacarpal and magnum, its tip being free and projecting upwards and outwards towards the trapezoid. Thirteen cases belonged to this class.

In the *second* variety of the first group the styloid process was irregular in outline and not prominent—it did not overlap the bases of the second metacarpal and magnum. The tip, directed upwards and very slightly outwards, was not sharply defined, but articulated by a flattened apex



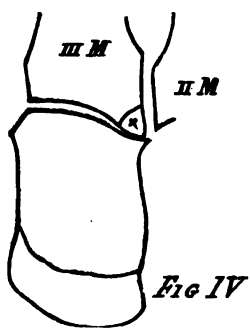
Points to depression.

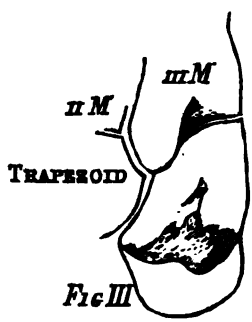


* Rough process.

with the os magnum, which here presented not a depression as above (Fig. I.) but a rough prominence (Fig. I.). Fifteen cases were of this kind.

In the SECOND group the os styloideum was also rounded and prominent, but articulated with three bones—viz., second metacarpal, trapezoid, and magnum. This group furnished 10 cases (Fig. III.).





† Pyramidal piece of cartilage.

The last case was one in which the tip of the process was formed by a pyramidal piece of cartilage which filled the interval between the second metacarpal and os magnum (Fig. IV.).

Summary of the articulations of the attached os styloideum:—

With two bones, second metacarpal and magnum . . .	31	cases
With three bones, second metacarpal, magnum, and trapezoid .	10	„
Total .	41	„

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Printed by John Falconer, 53 Upper Sackville-street, Dublin.

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